FOOD MANUFACTURE

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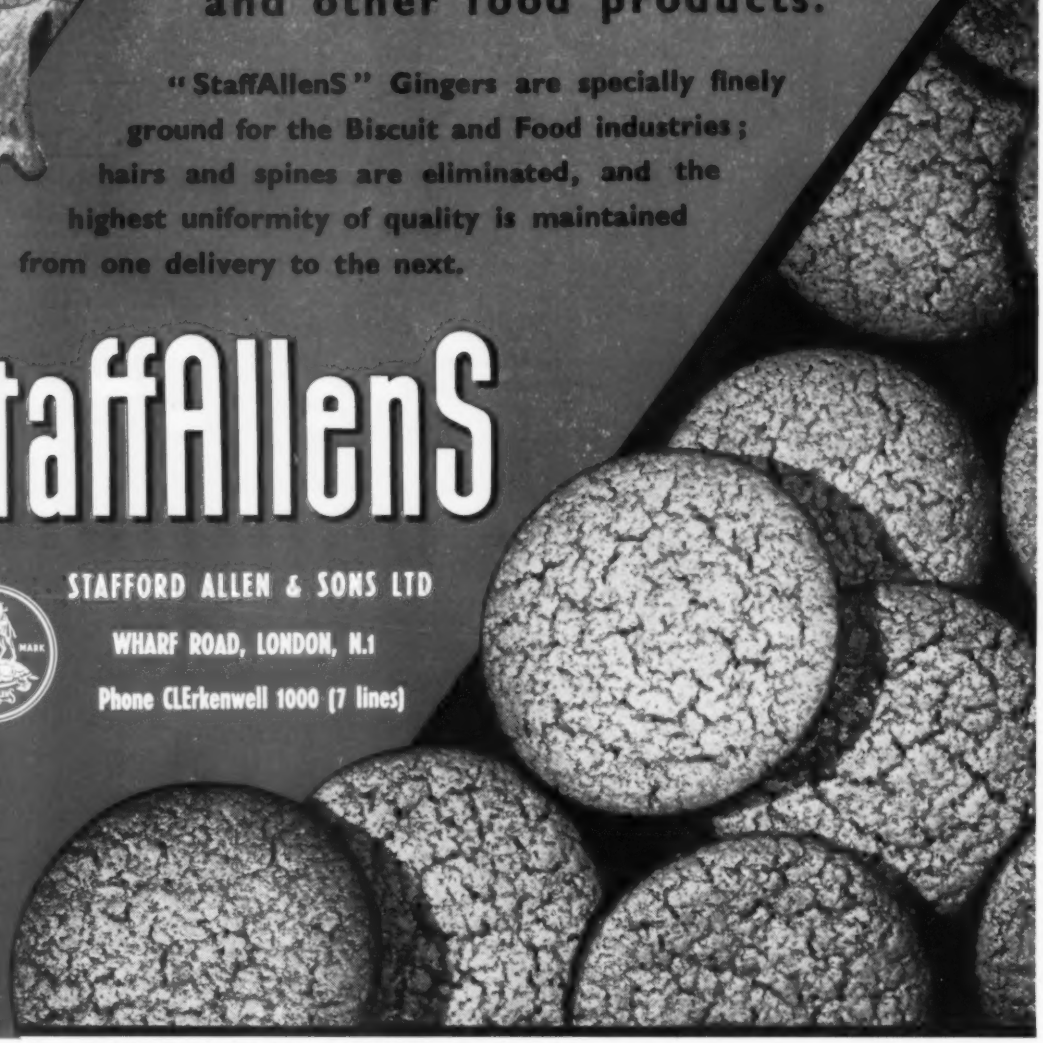

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FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XVI, No. 2 February 1, 1941

The Challenge on the Food Front

TOWARDS the end of 1940 the rate of loss of shipping in the Atlantic had forced us to cut down imports of a number of non-essential articles. Inevitably these included a number of fruits and other edible products. A bigger responsibility than ever consequently rests on the shoulders of the fruit and vegetable canning and processing industries. We know they can take it.

Just as we were writing to suggest the necessity of the distribution of supplies at fair prices and to comment upon the unsavoury pre-Christmas profiteering in many canned products, we received the news of the bold and comprehensive measures that the Minister of Food is taking to stop speculation in food. The Order which came into force on January 13 covers a very large range of foods, the prices of which must not be higher than was charged on December 2. This is an interim measure while maximum price orders are in preparation, and new Orders covering additional classes of foodstuffs are being issued almost daily.

The repercussions of this Order will, no doubt, cause certain temporary hardships, but it would be a pity to allow profiteering to mar our war effort, particularly since our position with regard to most staple foods is immensely superior to the enemy's.

The war on the food front is at its height, but it is not this country which is threatened by "General Starvation". Organisation of our kitchen economy to an increasing degree upon the basis of dairy products, potatoes and green vegetables (raw and canned) is one way of dealing with any serious emergency until the submarine menace is overcome, as it surely will be. Another strong card in our hands is represented by the substantial stocks of not strictly essential, but psychologically invaluable, articles like tea and coffee, articles which have been very heavily rationed or unobtainable in enemy territory for a considerable time.

First Things

"Don't bother me about trivialities like bananas," exclaims Lord Woolton, and we heartily concur. To get the daily milk and bread to the people in the face of normal transport breakdowns; to get the feeding stuffs to the dairy farms, the indispensable imports of grain and fats over the oceans; to keep up supplies of metal, glass and board to the food packers—these are a few examples of what comes first to-day. After that we can afford to think about oranges, lemons, onions and bananas.

A certain Royal Personage once advised the breadless Parisians to eat cake, thus putting the cart before the horse with a vengeance. In our total war against evil things it would be the height of folly to attempt to retain all the cake-like amenities of peace-time when by concentrating on the fundamental task of bringing the essential foods into every household the danger of a food shortage need never arise.

War-time conditions have not seriously aggravated the problems of malnutrition, much of which in peace-time was due not only to actual poverty but to faulty cooking and ignorance of food values. Paradoxically the war may be beneficial in the sense that interest in dietary values is being stimulated to a high degree among the general public. Canteen *menus* again represent a golden opportunity for effective utilisation of supplies. This opportunity is not always grasped, judging by the conspicuous lack of green vegetables in many of the meals provided.

Surplus Grain in the Americas

Both North and South America are faced with the problem of large exportable grain surpluses which apparently will continue to lie in store for an indefinite period. In Canada, ironically enough, the wheat crop is only a little below the high record of 1928, while the South American maize surplus at the end of 1940 was estimated at no less than 5 million tons. How much of these valuable commodities can be transferred to Great Britain will depend upon the outcome of the anti-submarine campaign in the next few months. It is, nevertheless, comforting to reflect that some portion of these feeding stuffs can be brought at a pinch to this country in the event of the situation becoming exceptionally acute.

Apart from their food value, grain crops are being used on an increasing scale as the basis of new chemical industries producing motor spirit, plastics, synthetic rubber, solvents and many fine chemicals. Maize fermentation to acetone was born out of the necessities of the 1914-18 conflict; plastics, varnishes and adhesives are among the products now manufactured from maize protein in the United States; the protein is also an exceptionally cheap source of amino acids of prohibitive price in the past, such as leucine and tyrosine; maize starch, on which some valuable research work has recently been carried out, is likely to find new technical applications. These examples are bound to strengthen the impression among chemists that proper coordination of industry and agriculture will bring prosperity to both departments and incalculable benefit to all mankind.

Phytohormones in Seed Treatment

The technique of treatment of cuttings of many plants with solutions of phytohormones (indole acetic acid, indole butyric acid, etc.) is now well established and the value of the process in accelerating rooting is beyond dispute. More controversial is the value of phytohormones as growth stimulants when applied to the seeds or directly to the soil. A number of investigations in this connection have been carried out with the aid of powder preparations containing a small percentage of hormone distributed in an inert vehicle such as talc.

Canadian grain farmers are interested in the utility of the technique when applied to grain before planting, and some experiments on these lines are described by J. W. Hopkins in *Canadian Journal of Research*, October, 1940. Indole acetic acid (the original heteroauxin which first proved its utility as a rooting agent) was selected in the tests after dilution with talc, the phytohormone dust being mechanically mixed with barley grain in quantity sufficient to introduce either 2·5 or 5 parts per million of growth-promoting agent. A control batch of seed was dusted with talc only. All growth tests were carried out under uniform conditions of soil humidity. From the standpoint of general application in the field the results were by no means en-

couraging, for the hormone-treated seed showed no improvement in growth characteristics over the control batch.

It seems that if any benefit at all is to be derived from hormone-treatment of staple crops it will be necessary to make considerable changes in the technique of application.

Apple Milk

Synchronising with Mr. V. L. S. Charley's experiments with fruit powders at Long Ashton are the proposals to utilise this and other products in the U.S.A. Our American friends grow plenty of apples—some 90 million bushels in an average year; besides eating them in the raw and in the form of fermented and unfermented juice they dish them up in a variety of appetising forms. We read of apple candy, apple table syrup, apple butter and apple powder. The last-named deserves consideration as the basis for a whole series of other food products, particularly in combination with milk, according to Vilbrandt and Sitz, writing in *Industrial and Engineering Chemistry*, October, 1940. It has already been proposed to add apple powder to milk for children and invalids, but the new developments envisaged are on a much more ambitious scale and involve a process of vacuum drum drying of a mixture of liquid skim milk and either clarified apple juice, expressed fresh cider, evaporated juice or peeled pulp, to mention but a few of the forms in which the apple can be utilised. This choice of the apple component is a distinct advantage to the manufacturer in the production of a wide range of toffees and chocolates, and there is the further possibility of controlling the texture and other qualities of the apple milk concentrate in the drying process itself. A particularly attractive form of sweetmeat would be a high-consistency apple milk dipped in plain or milk chocolate. Prospects for their introduction into this country are not particularly bright at the moment with milk in short supply and apples more or less off the *menu*, but the idea will be well worth taking up in more propitious circumstances.

Vitaminised Coffee

With the present vogue for vitamin-reinforcement of foods it was inevitable that someone should think of improving coffee in this way. Coffee beans actually contain a fair amount of both vitamins B and C in the natural state, but these are destroyed by roasting. To make matters worse, so we are given to understand, imbibition of coffee sets up physiological processes leading to excessive craving for carbohydrates which may themselves be somewhat lacking in vitamins. And so the coffee-crazed victim is still further thrown off his balance of diet. An apparatus described in a recent American patent comprises a roasting chamber, a receiver for the roasted beans and a device for injecting an atomised spray of vitamin solutions on to the roasted beans, which readily absorb the liquid. The process is economical enough, a solution containing 50 grams vitamin C and 3·34 grams vitamin B (it is not stated which part of the B-complex is used) being sufficient to restore the quota of these vitamins to one ton of roasted beans. Vitamin A, which is fat-soluble, can also be introduced in the form of an emulsion. The vitamins find their way into the water when the coffee is subsequently brewed. This type of reinforcement should appeal in particular to many people who now feel a moral urge to drink more milk but prefer it heavily diluted with coffee.

Rice Flour in Suet

The unsatisfactory state of our food regulations was emphasised by a case recently heard at Lowestoft. A grocer was summoned for selling a 2d. packet of shredded suet which was not of the nature, substance and quality demanded. It had been found to contain 19·05 per cent. of rice farina, which the analyst thought was excessive and unnecessary. The Society of Public Analysts had fixed 15 per cent. as the maximum, but his own opinion was that 10 per cent. was adequate. As a warranty had been given to the grocer it was decided that there was no case against him, and a discussion took place as to whether proceedings were to be taken against the manufacturers. However, the grocer waived his warranty defence and the summons was dismissed, the defendant being awarded 10 guineas costs. The manufacturers were prepared to fight the case. Almost every week valuable time and money are spent on the interpretation of what is "the nature, substance and quality demanded" of different commodities. As we have pointed out before in these pages, the interpretation is ofttimes a matter of topography. Surely it would help the manufacturers and retailers if, for instance, a fixed maximum of rice flour permitted to be added to suet be established once for all?

More Food from the Sea

Whale oil is an important commodity both in peace and war. Whales are believed to obtain their oil by assimilation from the plankton which drifts with the ocean currents. This miscellaneous collection of tiny flora and fauna is often observed to spread over vast expanses of water and probably extends to a great depth. The work of Hilditch and his collaborators has shown that many constituent organisms of plankton contain a high proportion of glycerides of unsaturated acids resembling those present in whale oil. Serious consideration is now being given to the possibility of directly extracting the oil from plankton, thus providing a useful additional source of edible oil. If such a project were successfully realised it would not necessarily spell the doom of the whaling industry, since the factory ships extract a number of other important materials such as gelatine.

Plankton may also be of interest for other products than oil. Extracts of plankton collected near our own shores (in the North Sea) have been found to contain carotene, chlorophyll and vitamin A.

Little attention seems to have been paid to the edible value of seaweed in this country, although the quantities thrown up on our shores each year must be immense. In Japan, on the other hand, cooked seaweed is a popular dish. Utilisation of seaweed is, indeed, a well-organised industry in the Far East; Japan alone works up several hundred thousands of tons each year, the chief products apart from edibles being iodine and agar agar. Russian scientists have tabulated the characteristics and uses of no fewer than seventy-three species and varieties of seaweeds found in Far Eastern waters.

Barley Sugar

We were interested in an article on modern standards of confectionery which was published recently in *Confectionery Production*. Discussing different classes of confectionery, the writer says, "If they can be rightly described as having a definite food value, as in the case of chocolate or barley sugar—to quote examples which can be elaborated indefinitely—the public demand is almost assured; but why barley sugar should be held in such universal esteem is a mystery to many practical sugar boilers, because it contains nothing more beneficial than can be found in the majority of good-class boiled sweets".

It is the word "mystery" that intrigues us, as we suggest that this should have been long since solved by what the Americans call "consumer research". They do this more thoroughly than we do in this country.

Apart from such research, we wonder whether the word "barley" has anything to do with it. Here we enter the psychological sphere. Does the sound of the word start the secretion of the "psychic juice"? Or is it the visual effect of the familiar twisted sticks bringing memories of delighted slobberings from childhood days which the prosaic albeit modern and more hygienic paper-wrapped "drop" fails to evoke?

Protective Coatings on Fruits

Application of a wax or other coating to fruit has long been practised and new data in this field are constantly being published. Recent American work has shown that wax-coated Arizona grapefruit can be stored without deterioration for as long as three months at 60° F. and a relative humidity of 88 per cent., provided they are harvested before reaching maximum bloom.

Reduction in loss of water content appears to be the chief factor in cutting down spoilage. Some authorities do not believe that decay is actually overcome by waxing, although we note from another American investigation, published earler in the year, that coating of apples with a wax emulsion appeared to inhibit development of bitter pit. It will also be recalled that diphenyl-impregnated paper wrappers caused an impressive reduction in damage to Jaffa oranges during shipment to this country. Apart from treatment designed to forestall or suppress the development of diseases, the artificial coating should be one which reduces excessive desiccation but does not seriously interfere with breathing. A good gloss is also desirable in many cases for the sake of sales appeal, a feature in which some waxes are defective. Supplementary buffing to achieve gloss involves risk of bruising. Latex suffers from the same drawback and may impart an undesirable odour.

Synthetic Resin Coatings

Some of the newer synthetic resins have recently been examined from the point of view of suitability as protective coatings on stored fruit in the United States, promising results being claimed for resins of the vinyl family. The latter include polystyrene, esters of methacrylic acid and polyvinyl esters, all of which are distinguished by glass-like clarity and good inherent gloss. An additional advantage is that they can be applied in the form of aqueous emulsions free from organic solvents. Special formulæ have been evolved for specific fruits and a proportion of plasticiser and natural resin has been found desirable in some cases. Thickness of coating must also be adjusted to the nature of individual fruits, bearing in mind the necessity for suppressing undue desiccation without impeding the passage of gaseous products of metabolism. Thus in the case of oranges an emulsion with 8·3 per cent. solid content has been found most effective; the actual composition of the dried film in this case is 32·8 per cent. polybutyl methacrylate, 32·8 per cent. polystyrene, 20 per cent. damar and 14·4 per cent. dibutyl phthalate. Heavier coatings are recommended for apples and tomatoes; so heavy, in fact, that they can be stripped from the fruit before use and might more accurately be described as synthetic glass-like envelopes. Further data on these lines will be awaited with interest, for there is no need to stress the importance of any new technique which will reduce fruit wastage without laying an impossible burden on the available cold storage accommodation.

Lecithin in Confectionery and Ice Cream

Evidence of the value of lecithin in various branches of the confectionery industry is contained in recent patent literature. Soya lecithin is a powerful wetting and capillary agent and quite a small percentage brings about an appreciable reduction in the viscosity of chocolate mixes. In this way it is suggested that economy can be effected in the use of cocoa butter. Lecithin substances contain both lipophile and hydrophile groups, which promote the formation of fat-water emulsions. In the case of metallic salts of long-chain aliphatic acids, the carboxylate group is hydrophilic, while the long hydrocarbon chain is the lipophilic group. Such salts may consequently be expected to function as emulsifying and viscosity-reducing agents in a similar manner to lecithin, and good results have actually been obtained in chocolate and toffee mixes with the aid of non-toxic salts, such as magnesium salt of corn fatty acids and the potassium salt of soya bean fatty acids, either alone or in admixture with soya lecithin. In chewing gum mixes a percentage of soya bean lecithin has been found to "smooth the chew" without reducing the all-important elastic structure.

The problem of substitutes for cream ices may arise this summer. A frozen confection resembling ice-cream can be obtained with the aid of lecithin as emulsifying agent. The process consists in dissolving the emulsifying agent in a liquid vegetable oil, gradually dispersing the latter in egg yolk or a concentrated milk powder suspension, and finally incorporating the other ingredients of ice-cream prior to freezing. A recommended emulsifying agent for this purpose is a mixture of 2 per cent. lecithin and 5 per cent. of the monoglyceride derived from fully hardened palm oil.

Food Production in Western Europe

The material assembled and checked on an agricultural journey in 1938, organised by Lord Astor and Mr. Seebohm Rowntree, has been recently published in a book by Mr. P. Lamartine Yates and is reviewed by Sir John Russell in *Nature*, **146**, 702. Mr. Yates deals exhaustively with the Western European countries—France, Belgium, Holland, Denmark, Sweden and Germany—and in his final chapter makes the comparisons with Great Britain.

British farmers have a much more difficult task than confronts the Continental and particularly the German farmer. The peace-time dietaries of the Western European countries are given a table by Mr. Yates which shows that the English dietary included considerably more meat, sugar, butter, fruit and vegetables than the German, but only half the potatoes and 12 per cent. less bread. On the average British yields, 1·6 acres are necessary to produce the food of the British consumer unit; the limited land area can at this rate feed only 40 per cent. of the British people. The German dietary, on the other hand, requires little more than half this land per head, and as Germany has twice the area of land that Britain has, but less than double the population, it is not surprising that they can attain more than 90 per cent. of self-sufficiency against 40 per cent. in Great Britain.

Output of Agricultural Workers

Another interesting table given in the book is the relative output per worker in the different countries' areas. The net output of the British agricultural worker is three times that of the French or German; the gross ouptut is still higher. No other European country begins to equal Britain in this respect, but this high output per man has not given us high output per acre. In some ways the two things are opposed and countries of high output per man frequently have low output per acre. The relation, however, is not rigid, and it is possible to achieve high output per acre and high output per man; that is the problem now confronting British agriculturists. There is no evidence that it can be done simply by enlarging our farming units; the countries that far surpass us in output per acre are all lands of small holders. But there is also no evidence that the setting up of small holdings would give any better results; in spite of considerable public expenditure on small holdings the numbers have continuously shrunk. The reorganisation must be in the direction of making fuller use of the technical and scientific knowledge now or in future available, so as to increase the efficiency of the land as well as that of the worker. The crux of the problem lies in the uncertainty of prices of agricultural produce. No other producers of commodities are in so insecure a position; all, except farmers, are always protected by contracts, and a similar arrangement seems indicated for agriculture.

In the canning of Ulster Meat Roll the different ingredients are put into eight baths, over which passes an overhead scale. The operative who mixes the ingredients weighs the correct amount of each into the scale, and when it comes to the end of the row of baths tips the contents of the scale into a silent chopper, where it remains until the correct texture has been obtained. The mixture is then automatically conveyed to a hydraulic stuffing machine which is used for filling 3-lb. cans.

CANNING IN ULSTER

A DESCRIPTION OF THE NEWFORGE FACTORY

THE POLICY of Newforge Limited may be epitomised as an attempt, successfully being achieved, at the complete elaboration of live cattle. Such an achievement brings in its train the successful confrontation of competition and the favouring of the primary producer in the matter of prices for his cattle.

Complete Treatment of Cattle

Such complete elaboration of the whole animal products may be divided into two categories—edible and inedible—and the ramifications of Newforge Limited include appropriate establishments to handle all products.

Newforge Limited is a branch of the old-established Scottish firm of Robert Wilson and Sons, Ltd., Barrhead, Scotland, and Trafford Park, Manchester.

Robert Wilson and Sons, Ltd., was established as a curing concern almost 100 years ago near Dunlop, a village in Ayrshire, Scotland. In 1912, owing to its extending activities, the business was transferred to Barrhead, where an extensive business in bacon curing and cooking and tinning of hams is carried on. The Manchester branch is solely concerned with the refining and manufacture of lard and vegetable shortenings and is equipped with the latest plant for this purpose.

In 1930, Newforge Limited was established in Belfast to handle the by-products and offal obtained from small curing concerns and waste materials from butchers' shops.

This company now controls three factories and a feeding-stuff compounding warehouse where meat meals, manufactured at the Burnhouse factory (mainly concerned with the production of inedible by-products) are utilised for livestock rations.

At the factory at Malone is handled all edible material, and an idea of its scope may be gathered by the fact that Ulster's entire dripping supply is made, and all surplus offals from the seventeen official abattoirs in Northern Ireland are trimmed, packed and frozen there, as well as the canning of meat roll, soups, dinners, tongues and Ulster Fry.

Ulster Fry

This is the result of a novel method for the utilisation of large quantities of beef and constitutes a popular alternative to the breakfast bacon.

Ulster Fry is not only an extremely high-grade product, but its unique Cellophane packing is far cheaper than tins, and it is well suited to mass production.

At Newforge Garden Factory, the home of Ulster Fry, over 20 tons of this delicious breakfast fry is manufactured weekly, and this is only a beginning.

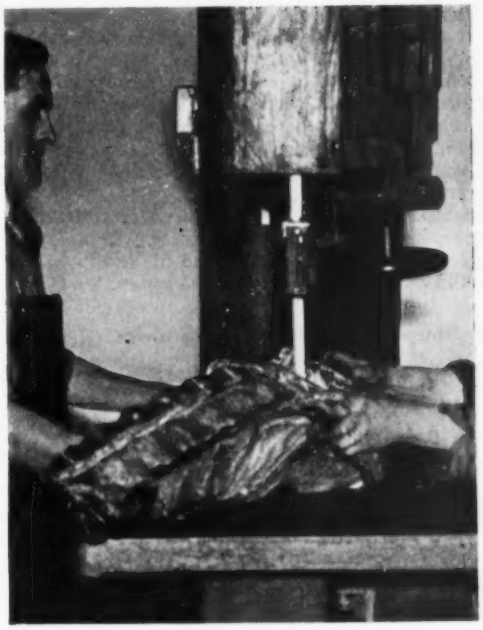
Immediately upon arrival at the factory the sides of beef are chilled and fed to an electric band-saw to be cut into small joints. These joints are carried away to a series of boning tables by continuous overhead conveyor.

Each boning table has a working crew of four men, each specialising in boning one particular joint, and six girls, who trim the meat free from skin, gristle and surplus fat.

Overhead Collection

The finished meat and fat are collected from the tables in large bogies running on an overhead track and tipped into long,

A section of the Meat Cutting and Trimming Department.



Cutting meat on electric bandsaw.

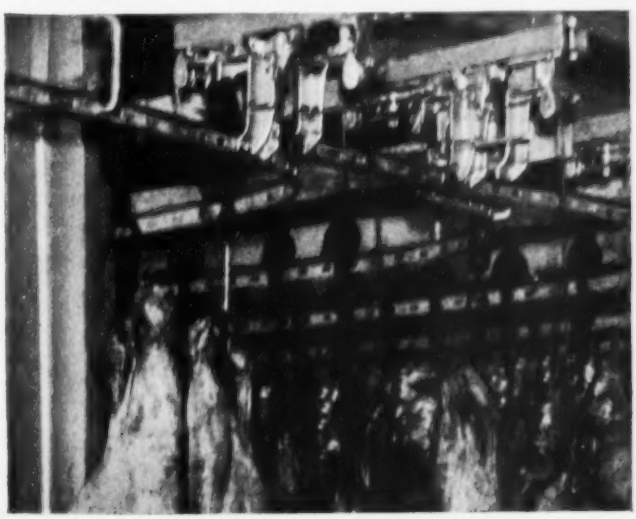
ice-cooled troughs in the blending-room. Over these troughs an overhead scale runs backwards and forwards, picking up the required amounts of lean and fat meat and depositing it in an ever-moving line of containers in convenient 50-lb. lots. The flavouring ingredients are then added and the meat tipped from the containers into large mincers. These mincers are of the standard pattern and reduce the meat to ½-inch cubes.

The minced meat slides by gravity down a long chute to the next floor and direct into a somewhat larger mincer. This reduces the meat to ⅞-inch cubes, the finished size.

By this method of double mincing not only is a more rapid and continuous flow obtained, but perfect mixing is achieved in the same operation by the natural tumbling effect of the gravity feed.

In the stuffing-room the standard type of hydraulic power sausage filler is used, but working at a somewhat higher pressure than usual.

Standard 6-lb. Visking casings are used, and after they are soaked the Ulster-Fry mixture is filled into them in exactly the same way as ordinary sausages. Each filler has a crew of eleven—one girl to feed the casing to the filling nozzle; a machine operator; eight men to tie and finish the casings; and one girl to pack away the frys into maturing boxes.



A detail of the overhead rail transporting system.

Filling and Maturing

While the machine is being filled by three of the crew the remainder tie up the first open end of the casings. When the machine is in operation the filled frys slide down a chute from the nozzle to the table, and operatives, working in pairs, close and tie the remaining open end and make a loop for subsequent hanging. The maximum daily output of each machine is 2,000 frys, involving the use of from two to three miles of string and the tying of 14,000 knots.

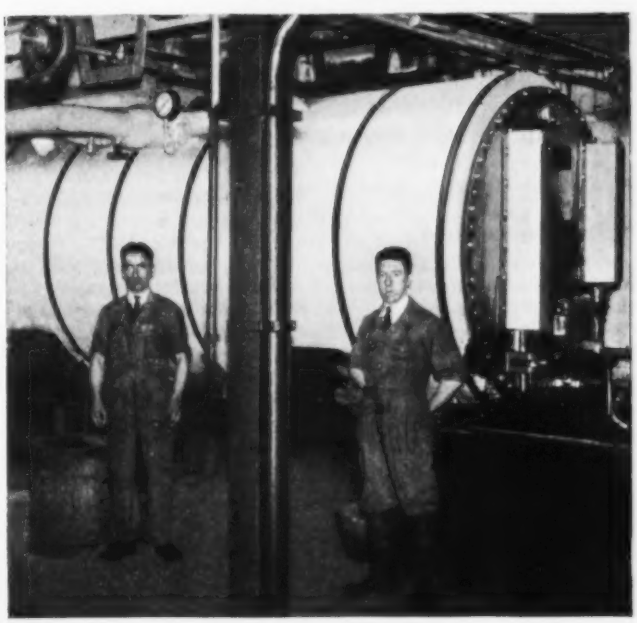
The frys are now left to mature for several days in a special air-conditioned chill-room.

The whole process of manufacture from carcass to maturing-room can be carried out in under twenty-five minutes, and with only a fractional rise in meat temperature.

Finally, the frys are hung up in large cages, slung on an overhead track. These cages slide into single-story heated and insulated smoke-houses, four cages each containing 120 frys to each house.

An old-fashioned smoking formula is used—wheat straw, oak sawdust and Irish peat, and at the same time the frys are tenderised by a special process.

The preparation of offals for the market is an important item, ox tails, ox and sheep hearts, kidneys, sweetbreads, etc., being conveyed from the different abattoirs by the Company's own transports in refrigerated trucks and also by rail. Arrived at the factory, they are weighed and put into overhead bogies, which convey them to the chill-room, where they are held prior to being trimmed. After trimming, the offals are packed into boxes of suitable units and then frozen. Shipment to England is effected in specially constructed insulated containers refrigerated by dry ice.



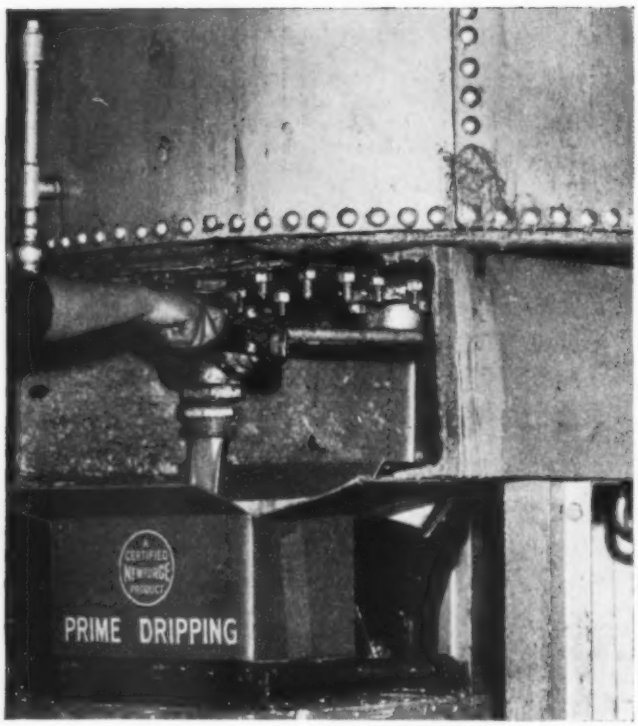
One of the huge cooking extractors for rendering dripping.

Dripping

Newforge Limited are the sole manufacturers of dripping in Ulster and are handling caul fat on behalf of the Ministry of Agriculture. The raw fat is conveyed on overhead conveyors to large tanks, where it is held in pure spring water until ready for cooking. This is done in a horizontal extractor capable of holding a 6-ton charge. The resulting oil is pumped into settling tanks, where it is washed and pumped over to another set of tanks for further settling, after which it is blown along steam-jacketed pipes to a cooling churn, from which it is run into cardboard boxes and made ready for despatch.

Canning

In the canning of Ulster Meat Roll the different ingredients are put into eight baths, over which passes an overhead scale. The operative who mixes the ingredients weighs the correct amount of each into the scale and when she comes to the end of the row of baths tips the contents of the scale into a silent



Cooling churn and filling arrangement for dripping.

chopper, where it remains until the correct texture has been obtained. The mixture is then automatically conveyed to a hydraulic stuffing machine, which is used for filling 3-lb. cans, the size used for marketing this product at the moment.

In connection with the cure of lunch and ox tongues for canning the artery pumping system is used.

Scientific Control

The Company is well equipped on the scientific side; at the Malone Factory there is a fully equipped laboratory staffed by five fully qualified chemists, who ensure that all products leaving the factory are made to a specified standard.

Tinplate, cereals, spices, meat, fat and gelatine are all tested either chemically or microscopically and certified before use.

The batches of tins in each retort are numbered and the numbers are written at the time on the temperature recorder chart. The laboratory files all charts and checks each record for conformity with the standard process laid down.

Closing the cans.

Systematic bacteriological tests are carried out on all products, which are also examined and reported on for appearance and flavour.

Heat-penetration tests, using the well-known Foster Thermocouples, are periodically carried out to ascertain if changes in weather conditions, etc., necessitate longer processing time.

In the event of bacteria being found, the hole made for inoculation is soldered up and the can seams tested, first under high pressure and then by filing through.

The bacteria are then examined for heat resistance and the results compared with the heat-penetration tests.

Such methods of doing business and the faith which is behind them should surely achieve further successes.

Canned Soups, Fruits and Vegetables

Lagan Valley Canners, Lisburn, in which Newforge Limited is interested, have recently opened a new factory for the canning of soups, fruits and vegetables. Meat pastes will also be handled. One of the first products made was solid pack apples in 1-gallon tins.

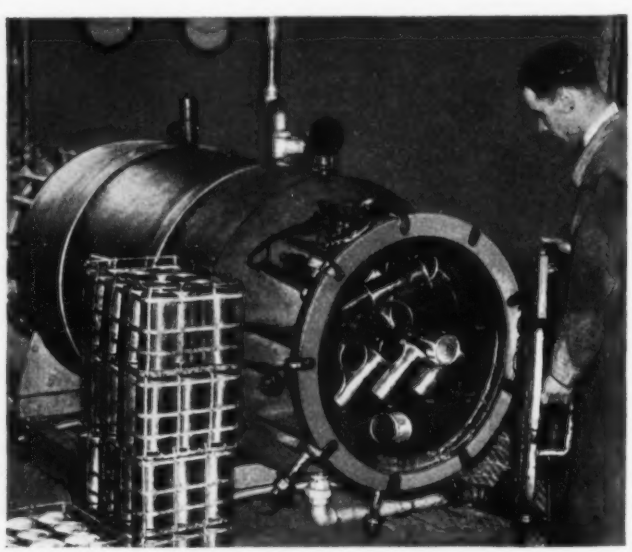
Basic Policy

Newforge Limited, which has made such rapid progress since its inception, attributes its success to three basic principles of policy, which are:

1. To provide congenial working conditions and as many jobs as possible for Ulster workers.
2. By elimination of waste and the adoption of modern methods to manufacture products which can be sold at their true value and which will enable them to purchase material from producers at its maximum price.
3. To produce for consumption, as producing for consumption implies that the quality of the article produced will be high and that the price will be low—that the article will be one which serves the people and not merely the manufacturer.

SOME SUPPLIERS TO NEWFORGE LIMITED

Band-Saw for Cutting Meat: *Sagar and Co., Ltd.*
Roller Conveyors: *Herbert Morris, Ltd.*
Mincing Machines: *Hobart Manufacturing Co., Ltd.*
Silent Chopper: *J. C. Wetter and Co.*
Stuffing Machines: *J. C. Wetter and Co.*
Solvent Extraction Plant for Fats: *George Scott and Sons (London), Ltd.*
Refrigeration: *L. Sterne and Co., Ltd.*
Thermometer and Recorders: *Cambridge Instrument Co., Ltd.*
Electrical Laboratory Apparatus: *A. Gallenkamp and Co., Ltd.*
Meat and Bonemeal Grinder: *Christy and Norris, Ltd.*
Overhead Tracking and Droppers: *Industrial Waste Eliminators, Ltd.*
Boilers: *Cochran and Co., Ltd.*
Closing Machines: *E. W. Bliss Company.*
Retorts: *Maidens, Ltd.*
Dough Mixer: *Baker Perkins, Ltd.*



One of the eight retorts installed in the factory.

THE ELABORATION OF CATTLE FOR CANNED MEAT AND BY-PRODUCTS

T. CROSBIE-WALSH, F.I.C.

THE TECHNOLOGY of meat canning starts with the live cattle. The meat canner in this country, with some exceptions, is not greatly concerned with this, as he gets his meat dead. No consideration of meat canning, however, would be complete without some study of the live animal and the products, other than meat, obtainable from it.

As to classification, this is a matter of individual judgment. A rough classification purely from the factory angle and without reference to any classification adopted by the cattle department is given here.

Steers:

(1) Fair freezing steer—about four years old.
(2) Good canner—steer from four to five years old.
(3) Thin canner—steer from four to five years old.

Cows:

(1) Fair—seven years upwards.
(2) Good—seven years upwards.

Calculated on an average of a minimum of 100,000 head in each class, the following are the live weights of the classes of animals:

Fair freezing steers	1,034 lb.
Good canner steers	990 ,,
Thin canner steers	900 ,,
Fair canner cows	792 ,,
Good cows	880 ,,

The problem of the cattle buyer is that of selecting the class of animal for canned meat that will provide the most profitable yields, not only of meat, but of by-products. It will be realised that the position is always changing owing to fluctuations of the prices of everything, from the cattle to the most unimportant by-products.

The method of calculation does not take bone into account. Boneless meat is what the canner is interested in. The meat may be stripped from the bone as soon as the animal is killed, and the bones are taken away for elaboration into the various by-products.

The percentage of meat obtained from the different classes of animals varies considerably. The following are the percentages of meat without bone obtained from the five classes of animals, and also the meat ready for use in this case is corned beef, but would apply to other packs:

	Per Cent.	*Corned Beef on Live Weight.*
Fair freezing steers ...	43·5	25·5
Good canner steers ...	41	23·3
Thin canner steers ...	39	21·5
Good cows	40	23·0
Fair cows	36	20·0

The meat represented by these percentages is not that which wholly goes into the can. There has to be deducted certain residues trimmed off in the raw state, sinews from the cooked meat, and finally excess raw fat. It will readily be seen that these factors are important when selecting cattle for meat packing.

In considering costs it is important to take into consideration the numerous by-products. The canner buys the beast, and one way to establish beef costs is to consider that everything in the way of raw material for by-products has no calculated value—that is to say, they are not costed into the various departments. When they are duly converted into manufactured products the difference between the cost of their preparation plus overheads, and the selling price, is credited (if it is on the right side) to the cost of the animal and from thence to the cost of the beef for the main product.

The yields of raw meat, manufactured meat products and by-products of a steer or cow are shown in Table I.

The bones, except the manufacturers' bones, are, after treatment for fat extraction, during which the best of them yield soup stocks of different qualities, converted either into bonemeal or mixed with organic material to make mixed fertiliser.

The blood is made into blood meal, intestines into sausage casings; bains, sinews, hoofs, horn piths, gall, gallstones, glands for medicinal purposes, even ear hairs—all are carefluly prepared.

Some important work has been done comparatively recently on ante-mortem and post-mortem precautions in handling meat. Although this was mainly with reference to pigs and the bacon made therefrom, it has an application in meat canning.

Well-rested animals still have a store of glycogen, and after death this glycogen is converted into lactic acid, which has a favourable effect upon pickling.

The animals, on the way to the slaughter-house, usually walk singly along a passage-way, along fifty yards of which are fixed overhead water pipes, by which the animals are well sprayed. Apart from the cooling effect, the benefit of which may have a greater or lesser significance, it is certainly a good thing from the point of view of cleanliness.

The abattoir work is carried out with efficiency and speed. There are several ways of handling the carcases. In the large factories where canned meats are the main activity the animals are boned immediately after killing, and the meat used without any prolonged storage. In others the carcases are hung in cold storage and boned afterwards. All this does not apply to English practice, and meat canners in this country receive their meat already killed and sometimes boned, and, except for such items as briskets, tongues and suchlike, there is relatively little beef and mutton canning done on any scale in this country. There are, however, sundry factories in England, Northern and Southern Ireland which elaborate products from the whole animal, and before the war there was much talk about cull cows in this country for the same purpose. In Aston and Rowntree's book *British Agriculture* is contained a proposal to increase the cow population of this country by something of the order of 2,000,000, and the matter of the disposal of the dry cows would, if this were realised, become of interest. However, under present conditions this is a matter for the future.

Hanging of Meat

The period of hanging of meat and the temperature at which hanging is conducted has a profound influence upon the curing process, and consequently upon the colour and texture of the canned product, and also upon the quality of by-product extract obtained

In Table II. are given some analytical figures showing the effect of hanging on acidity and Sorensen figure, which latter is a useful rough-and-ready test for the meat laboratory.

The figures in the table show how careful it is necessary to be in the practical interpretation of analytical figures. In the first set, showing increase of acidity at 18° C., maximum acidity is reached after 7 hours, whereas in the second set the acidity between 8 hours and 24 hours was very much increased. The difference may be attributed to different causes, the most probable being bacterial action, the effects of which may be plainly seen in the figures for 24 and 48 hours of hanging at 23° C.

Some very valuable studies have been made recently by E. C. Bate Smith on the physiology of rigor mortis, which might well be collated with results in the canning factory. He has investigated (1) rate of acidification of muscle post-mortem; (2) changes

TABLE I.

	Fair Freezing Steer. (*About 4 yrs.*)	Good Canner Steer. (*4-5 yrs.*)	Thin Canner Steer. (*4-5 yrs.*)	Fair Canner Cow. (*7 yrs. upwards.*)	Good Cow. (*7 yrs. upwards.*)
Average Yields.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Live weight	1034	990	902	792	880
Total meat without bone	450·0	405·9	353·0	285·1	353·0
Distribution of Meat.					
Trimmed meat for corned beef	380·4 (84·6 %)	342·4 (84·4 %)	302·0 (85·5 %)	236·6 (83·0 %)	293·9 (83·5 %)
Sinews extracted from corned beef	10·8 (2·4 %)	10·6 (2·6 %)	10·6 (3·0 %)	8·6 (3·0 %)	8·8 (2·5 %)
Meat residues	38·0 (8·5 %)	37·6 (9·0 %)	34·4 (9·8 %)	20·9 (10·5 %)	33·6 (9·5 %)
Raw fat	24·4 (4·5 %)	16·10 (4·0 %)	6·10 (1·7 %)	10·00 (10·0 %)	15·7 (4·5 %)
Corned Beef.					
Yield of corned beef from raw beef	262·50 (69·0 %)	231·10 (67·5 %)	180·90 (64·5 %)	158·50 (67·0 %)	202·80 (69·0 %)
Corned beef on live weight	25·4 %	23·34 %	21·52 %	20·02	23·04 %
By-Products.					
Raw tongue	3·72	3·26	2·97	2·60	3·17
Cooked tongue	2·22	1·94	1·78	1·54	1·87
Green hide	73·70	79·20	74·80	58·44	61·16
Salted hide	56·76	61·78	57·60	46·33	48·05
Tallow	48·40	40·70	27·72	28·82	39·60
Premier jus	18·70	18·70	11·00	14·30	18·70
Edible dripping	11·64	9·15	3·06	5·48	8·90
Marrow fat	0·94	0·95	0·84	0·79	0·86
Neat's-foot oil	0·92	0·88	0·79	0·70	0·79
Total rendering fatty matters	80·61	70·38	43·40	50·09	68·86
Total bones per head	165·41	159·50	154·00	116·60	129·80
Bones to soup, excluding feet, knees and horn piths	103·4	97·90	92·40	68·20	78·10
Organs to soup stock	20·68	19·80	18·04	15·80	17·60
Scraps to soup stock	8·58	8·14	7·48	7·00	7·90
Total soup stock per head	14·50	13·70	12·71	10·30	11·70
Blood	8·8	8·4	7·5	6·6	7·5
Tankage	70·40	68·20	61·60	55·00	59·00
Horns	1·43	2·6	2·6	1·50	0·90
Casings: Rounds (metres)	23·50	22·00	21·50	20·00	21·00
Middles	7·35	7·25	7·25	6·50	7·00
Bungs	1·20	1·10	0·95	0·80	0·90
The same cattle dressed as butcher's beef	606·98 (58·7 %)	554·40 (56·00 %)	479·16 (53·10 %)	380·82 (48·09 %)	464·20 (52·75 %)

of elasticity in rigor mortis, with reference to the effect of temperature, presence of glycogen and pH; and (3) change in solubility of the muscle proteins in rigor mortis.

The effects on the finished product of the judicious hanging of meat are far-reaching. A properly matured meat, after canning, "melts in the mouth"; the muscle fibres are softened in quite a different way from the subsequent softening due to curing and processing, and a smooth, velvety appearance is produced. Sliceability—a selling point of considerable importance—is enhanced, and the pink colour of cured meats is more vivid. Meat pastes have a smoother texture and mature more quickly in the jar. Upon by-product extract of meat the effect is still more notable, as will be shown when these products come to be discussed.

TABLE II.

Effect of Hanging Beef

Temperature of Hanging (° C.).	*Time of Hanging.*	*Acidity as Lactic Acid. (per cent.)*	*Formalin Titration (Sorensen) as Lactic Acid, Less Acidity as Lactic Acid in Col. 3. (per cent.)*
18	Rigor mortis	0·488	0·855
18	2 hours	0·493	0·947
18	4 ,,	0·493	0·975
18	7 ,,	0·595	0·975
18	24 ,,	0·597	0·976
23	Nil	0·325	0·535
23	2 hours	0·337	0·573
23	4 ,,	0·339	0·575
23	6 ,,	0·344	0·620
23	8 ,,	0·387	0·659
23	24 ,,	0·628	0·856
23	48 ,,	0·456	0·770

Trimming and Cutting

The meat is trimmed according to a specified plan—veins, sinews, fat, glands, etc., being removed in their order and the separated materials conveyed to the different by-product departments for treatment.

There seems to be a need for some item of plant for cutting meat for canning. Many meat canners do this by hand, presumably because they consider that the cost of a cutter—if, indeed, a satisfactory cutter can be obtained—is not warranted by reason of the comparatively small amount of meat handled.

So far as has been ascertained, there does not seem to have been evolved a cutter, on the same lines as the larger one, suitable for smaller production, and thus the smaller meat canner has to rely on hand cutting.

In the larger factories cutting of portions of boneless meat is done by the use of two sets of disc cutters, composed of anything up to 32 circular cutting discs each, set at a distance of from 1 to 2 inches apart.

The large pieces of meat are thrown on to the first set of revolving cutters and fall on to the other set which is installed below it. From the second set the meat, now suitably cut, is conducted to the pickling or cooking vats, according to the process used.

Such a set as has been described has a capacity of 10,000 lbs.

per hour, which is considerably above the production of a moderate-sized canning factory.

The Curing Process

There are three main methods of curing:

(1) Long curing and long-continued use of the pickle.
(2) Short curing with sterilisation of pickle.
(3) The hot cure.

The long cure is extensively used in this country for curing briskets, tongues and various meats. After varying numbers of days, according to the ideas of the individual canner, the meat is taken out and cooked. The used pickle is reinforced with salt so that the percentage of that substance is brought up to its original level after the removal of the meat. According to Mr. J. W. Black, what are nominally the same brines may be kept in circulation for years, although they must not be weak ones. The main point to be observed is the maintenance of the brine-house at from 40° to 42° F. The systematic aeration of the brines is necessary, either by pumping from the vat to another between changes or, if used brines are returned to a main deposit, by aeration and filtration of the bulk. Mr. Black has found that as time goes on the resistance to heat of the bacteria contained in the brines becomes lower and lower, and that the resistance to heat of old spores is much less than that of young spores.

It is obvious that especial care has to be taken with the brines used in the manner described. The canned products made from these brines are excellent and have a "mature" flavour, but, considering them from the point of view of standardisation, it seems hardly likely that the characteristics of meat cured when the pickle is new will correspond with that cured in an old pickle.

The second method of curing was one which was evolved about the time of the last war. Due to the tremendous amount of canned meat—mostly corned beef—called for by the troops (South America provided not only iron rations for the British, but also for the French, army) the old methods still adhered to by the majority of canners became unwieldy, and two methods were used—the short cold cure and the hot cure.

The Short Cure

The short cure consists in immersing the raw meat in pickle for a maximum of twenty-four hours at ordinary temperature—that is to say, the temperature of a cool cellar, which, however, is not necessarily artificially cooled. The pickle is then drawn off, and sterilised either by boiling in open tanks or in retorts under pressure. The requisite amount of salt is added during this operation, so that every constituent of the pickle is sterilised. Gravity is taken advantage of as far as possible during the handling of the pickle, and only one pumping should be required—*i.e.*, to the tank feeding the sterilising tanks or pressure vessels. During the week-end the pickle is either run away and a fresh lot made, or kept sufficiently hot to avoid bacterial decomposition. A nice little calculation for the engineering department is whether the loss of salt is greater in cost than the steam used. This would depend upon satisfactory lagging of the vessels and the like. This cure produces a mild-tasting product—the taste was definitely milder than pre-1914 product, mainly because the specifications of the British War Office put down a maximum salt content of 3 per cent. for canned beef. Pre-war canned beef had contained anything up to 5 per cent. salt as sodium chloride. The canners were obliged to be very careful not to have their shipments rejected on account of too high a salt content, and usually aimed at about 2¾ per cent.

The Hot Cure

The increasing demand for extract of meat caused the canners to search for some way of getting the extractives, a proportion of which was unavoidably taken away by the pre-cooking operation. The hot cure process was evolved, which differed from the one previously described in that the meat was cooked before, instead of after, pickling. This meant that there was no salt, saltpetre or sugar associated with the cooking liquors, which could be evaporated to make extract of meat, and was a great step. It should be stressed that it was by no means one which sought to rob the meat of its extractives, but rather to take advantage of the extractives separated during the inevitable pre-cooking which the meat has to undergo before it goes into the can—at all events, when it is a question of making a solid pack such as tongues, jellied veal, beef or mutton.

The liquors resulting from the cooking of the already pickled meat do not produce a satisfactory extract; long before they reach the pasty stage they become a saturated solution of salt. Many attempts have been made to make an extract from these liquors, but the result was not satisfactory.

In the hot cure the raw meat is boiled in plain water for as long as necessary, and according to the yields required. The hot meat is then put into a hot pickle, in which it remains for a maximum of 24 hours. The used pickle is drawn off, salt added to bring it to the requisite strength again, and filtered for the next round. The liquors in which the meat has been cooked are concentrated under vacuum to produce extract of meat.

There resulted some difficulties when the hot cure was first introduced. Apart from others, there was the nitrite difficulty. Saltpetre has been used for a very long time for the purpose of producing the characteristic pink colour of cured meat.

The colour of the raw meat is produced by the reaction between reduced saltpetre (or nitrite) and the hæmoglobin of the meat. It is mainly NO hæmoglobin. When the meat is cooked this NO hæmoglobin is converted into NO hæmochromatin. Quite a number of problems arose at the beginning of the adoption of the hot process, among them being the unsatisfactory colouring of the meat.

The *Rôle* of Saltpetre

Apart from its *rôle* (after its conversion into nitrite) of producing the pink colour of cured meat, saltpetre has been claimed to maintain aerobic conditions within the meat during pickling, thus tending to prevent the development of putrefactive organisms of the anaerobic type. J. Richardson, in a paper in the *Journal of the American Chemical Society* in 1907, published some data upon this. The author made some similar experiments a considerable time later than this, and was not able to confirm Richardson's findings. It is a rather important point, as the tendency is to call saltpetre a preservative in connection with meat curing. It depends upon the quantity of any substance used as to whether it will set as a preservative, and, according to the author's experiments, he found that in the proportions ever likely to be used in meat curing there was no inhibitive action upon bacteria.

The experiments were performed in connection with the cold process, as these matters do not arise on the hot process, as will be demonstrated. The usual amount of saltpetre (potassium nitrate) used was 400 grams for every 1,000 kilos of meat; that is to say, 0·04 per cent. Some sample lots of meat were cured with 4,000, 400 and 200 grams of saltpetre for every 1,000 kilos of meat.

Without going into precise details—the meats were very thoroughly examined chemically and bacteriologically—it was found that, after incubating the cured meat for 24 hours at 37° C. the meat with the very large amount of saltpetre was quite putrid, while the other two were only slightly tainted. This matter is important when considering the replacement of saltpetre (either sodium or potassium nitrate) by sodium nitrite. From the point of view of preservation there is no reason why saltpetre should be present, although the idea is still very prevalent.

Other Cures

The author received recently a private communication from the Argentine Republic which told of methods being adopted which eliminate the conventional curing process and put all the ingredients into the tin with the cooked meat. This method was put into commercial practice by the author in 1920 and has its advantages, and such defects as it possesses may be overcome by various devices.

There can be no doubt but that the old method of curing gives a more "tasty" product than the new, and so long as the old pickles are taken care of in the way suggested above there is no reason why the smaller manufacturer should modify his methods. The reason for the development of the new cures was solely the need to take advantage of the cooking liquors for extract of meat, and this point does not arise with the English meat canner, although the comparative simplicity of making extract of meat on a small scale might well attract those dealing with an appreciable amount of meat liquors.

(*To be continued*)

CANNED SALMON

ITS NUTRITIVE VALUE

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WHILE quantitative information respecting the nutritive values of foods is important at any time, it is particularly so at the present time. In order that the best use may be made of all available foods, any data respecting their nutritive values should be made accessible to consumers and to those in charge of Army, Navy and institutional purchasing.

Canned salmon is a food of high nutritive value. Not only does it contain large amounts of protein and fat, but it is a valuable protective food, since it contains vitamins and essential minerals in considerable amounts. It is the purpose of the present review to bring together existing data regarding the nutritive value of canned Pacific salmon, with particular reference to that produced in British Columbia.

Species of Pacific Salmon

Five species of the Pacific salmon (genus *Oncorhynchus*) are caught in the coastal waters and streams of British Columbia. They are commonly known as the spring, the sockeye or red, the coho or medium red, the pink or humpback, and the chum salmon. While part of the catch of each species is canned, some species are more particularly suited to this purpose than others; that portion of the catch not canned is consumed fresh or preserved by other means. Thus sockeye and pink salmon are usually canned; spring salmon are more frequently "mild cured" or frozen, coho frozen, and chum salted. Most of the fresh-fish market requirements are supplied by the two species spring and coho.

The protein, oil and salt-free mineral contents of canned British Columbia sockeye and pink salmon were investigated by Carter.[1] Riddell[2] made similar studies of canned British Columbia coho salmon. Both these investigators calculated the energy contents of the samples they analysed. The ranges and average values of their data are given in Table I.

TABLE I

COMPOSITION AND ENERGY VALUE OF CANNED BRITISH COLUMBIA SALMON

	Protein per cent.	*Oil* per cent.	*Salt-free Minerals* per cent.	*Salt* per cent.	*Calories* per lb.
Sockeye :					
Average ...	20·1	9·3	1·4	0·0	787
Range ...	19·0–21·0	5·7–15·5	1·3–1·7	0·5–1·4	658–852
Pink :					
Range ...	17·8–20·6	2·5–9·6	1·3–1·7	0·7–1·4	507–742
Average ...	19·4	6·4	1·5	1·0	633
Coho :					
Range ...	19·0–21·0	2·8–6·8	1·0–1·9	0·4–1·7	482–679
Average ...	19·9	4·5	1·4	1·1	562

The different mineral constituents in the ash of canned British Columbia sockeye, pink and coho salmon were investigated by Riddell.[3] His data are given in Table II.

TABLE II

COMPOSITION OF ASH OF COMPOSITE SAMPLES OF CANNED BRITISH COLUMBIA SALMON

Species	*CaO*	*MgO*	P_2O_5	SO_3	Na_2O	K_2O	*Cl*	*Cu*	*Mn*
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	parts per million of ash	
Sockeye	13.91	2.33	28.65	0.48	14.73	21.00	12.65	95.0	7.5
Pink ...	10.71	2.05	23.91	1.18	22.05	19.78	18.41	51.0	0.0
Coho ...	15.85	2.07	27.32	0.13	13.45	16.91	13.45	34·0	102.0

The iron content was not studied by Riddell, but McCance and Widdowson[4] state in their tables of chemical composition of foods that canned salmon contains 1·3 milligrams of this mineral per 100 grams (13 parts per million).

Jarvis, Clough and Clark[5] made a study of the iodine content of canned Pacific salmon from Alaskan and North-Western American waters. The following are their average values, expressed as parts per billion of wet material : Sockeye, 405; pink, 264; coho, 206; spring, 364; chum, 242.

Vitamin Content

The presence of vitamins A and D and the pellagra-preventative factor in canned salmon has been demonstrated. It is a particularly good source of vitamin D, the antirachitic vitamin. Bailey[6] found that samples of the oil from canned British Columbia sockeye and pink salmon contained from 50 to 67 International units of vitamin D per gram. On the basis of a mean oil content of 9·3 per cent. and 6·4 per cent. respectively for canned sockeye and pink salmon (see Table I), the average vitamin D content per gram of canned material would be 5·4 International units for sockeye and 3·7 units for pink (2,450 and 1,680 units respectively per pound of canned material). While the actual vitamin D contents of both pink and sockeye vary considerably, the above figures indicate what may be generally expected. Bailey's results indicated that canned salmon contains very little vitamin A, the potency of sockeye being low and that of pinks negligible. Devaney and Putney[7] also studied the vitamin A and D content of canned Pacific salmon. The following are the average values which they obtained for the vitamin D in the whole flesh : Red, 8·0; pink, 6·2; spring, 2·9; chum, 2·2 International units per gram of canned material. The averages of their vitamin A values were : Red, from 2 to 4 International units per gram; pink, 1; spring, from 4 to 8; chum, less than 0·5.

The activity of canned salmon as a preventative of pellagra, a deficiency disease now known to be due to a dietary deficiency of nicotinic acid, was studied by Goldberger and Wheeler.[8] They found that a small amount of canned salmon added to a diet deficient in the pellagra-preventative factor cured the disease in human patients.

The value of canned salmon as a dietary constituent can be seen from the data presented. It is rich in protein and fat, and is a good energy food. It contains considerable amounts of calcium and phosphorus and also vitamin D, the vitamin which regulates the assimilation of these two minerals. The traces of copper which it contains make it particularly valuable in the prevention of nutritional anæmia.

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AEROGENIC SPOILAGE OF CANNED RICE PUDDING

A typical study of bacterial spoilage of a canned product, the micro-organisms involved being a streptococcus and a low-temperature gram-negative rod.

C. D. MORRIS, N.D.A.

IN a milk factory producing, amongst other dairy products, canned rice pudding, under carefully controlled conditions, a small proportion of "blown" tins were found to occur after storage for two or three weeks at atmospheric temperature. This defect was investigated, and the unusual findings were as detailed below.

Experimental Technique

Tins of 16 ozs. (approx.) capacity were examined—smaller tins of 8 ozs. (approx.) capacity similarly affected at the same time were not investigated—and found to be badly bulged at one or both ends. A number were punctured aseptically, the gas allowed to escape, and a little of the more fluid portion of the contents withdrawn with a sterile pasteur pipette; from this smears and cultures were made. The tins were then fully opened with a tin opener, and the contents were found to be thickened, but to have no other odour than that of sour milk.

Smears, stained by Gram's method, showed numerous short-chained *streptococci*, and in some instances a tentative diagnosis of Gram negative rods was made, later to be amply confirmed by cultures. No spores or bacterial forms suggestive of spore-bearing organisms were ever seen in smears prepared in this way.

Cultures were made by withdrawing a little of the material from the tins with a sterile pasteur pipette, diluting this in a sterile saline and plating out on nutrient agar and malt agar; cultures were also made in nutrient broth and Robertson's meat broth. All were put up in duplicate, one set being incubated at 37° C., and the other kept at room temperature (approx. 22° C.). After 24 hours the findings were as follows:

	37° C.	22° C. (approx.).
Malt Agar.	*Negative (for moulds).*	*Negative (for moulds).*
Nutrient Agar.	*Numerous colonies of Streptococci.*	*Numerous slightly fluorescent colonies of Gram negative rods.*
Nutrient Broth.	*Streptococci.*	*Gram negative rods.*
Robertson's Meat Broth.	*Few Streptococci.*	*Gram negative rods.*

Well isolated colonies were immediately picked off the respective nutrient agar plates, sub-cultured on nutrient agar slopes, each at its optimum temperature and examined for purity.

All primary cultures were incubated at both temperatures for a further period of three days, and in addition the malt agar plates were incubated for another week, no new flora developed, the only difference being that after 48 hours a slight growth of the Gram negative rods appeared on the nutrient agar plates kept at 37° C.

Pure cultures of both the organisms having been obtained without any difficulty, they were next tested separately and as a mixture by inoculation into tins of rice pudding which had been stored for some weeks and remained unspoiled. Eighteen-hour broth cultures grown at the appropriate temperatures were used. The tins were inoculated with approximately 0·5 ml. of cultures by means of pasteur pipettes, which were inserted through a hole drilled in the top of the tin and afterwards sealed by soldering. Rigid asepsis was observed. For the mixed culture, equal quantities of separate broth cultures were mixed and this formed the *inoculum*.

The tins were kept at room temperature together with uninoculated controls. Bulging occurred in all except the controls in periods of from 36 hours to 156 hours, as set out at the top of the next column.

After 156 hours no further changes were obvious; all tins were opened and examined as in the case of the primary specimens. Pure cultures of the *streptococcus* and the Gram negative rods were readily recovered from the tins which had been inoculated with these organisms, and a mixture of the two organisms from the tins which had been so inoculated. No

Inoculum.	Times after Inoculation.			
	36 *hours.*	48 *hours.*	60 *hours.*	156 *hours.*
Streptococci.	No change.	No change.	No change.	Tin distended at both ends.
Gram negative rods.	No change.	Tin distended at one end.	Tin distended at both ends.	Further increase of distension.
Mixture	Tin distended at one end.	Tin distended at both ends.	Increase of distension.	Further increase of distension.

other organisms were found. It is noteworthy that direct smears stained by Gram's method failed almost entirely to show up the Gram negative rods, mainly owing to lack of contrast staining. The tests were subsequently repeated with similar results. The most definite distension occurs, as would be expected, with the mixture of organisms, but the *streptococci* appear to play a somewhat minor part; the amount of distension they produce alone and the speed with which it is produced are much less than in the case of either the Gram negative rod or the mixture.

The two organisms were examined in an unsuccessful attempt to identify them precisely:

The Streptococcus

Morphologically this organism shows a distinct tendency to lanceolate forms, and it occurs in pairs and short chains, suggestive of *Strep. lactis*. Agar colonies are typical of the genus. Gelatin is not liquefied. The organism was heat resistant (60° C. for 30 minutes) in both nutrient broth and litmus milk when freshly isolated. Other reactions may be tabulated thus:

Xylose.	Glucose.	Lævulose	Maltose.	Lactose.	Saccharose.	Raffinose.	Salicin.	Inulin.	Mannite.	Litmus Milk.
—	A	A	A	A	A	A	A	A		AC

No trace of gas was formed (inverted Durham tube method) by this organism from any sugars at 37° C. or 22° C., either aerobically, anaerobically, or in 20 per cent. CO_2. An attempt was made to determine if some factor present in the rice pudding or rice grains was being split up with the formation of gas. Tubes containing peptone water, indicator and inverted Durham tubes, all sterile, were used, and to them was added (*a*) a little rice pudding from an unspoiled tin, and (*b*) a little rice from a sample obtained at the canning factory; these were then sterilised again by intermittent steaming. The *streptococcus* failed to produce any gas under these conditions.

The organism appears to present many of the characters of *Strep. lactis*, and to belong to the *Lactis-Fæcalis* group. As would be expected, litmus milk is the best medium for its maintenance in artificial culture, and in this connection it is interesting to note that it withstands acid conditions well, being readily recoverable from month-old litmus milk cultures which have stood at room temperature, and developed a firm clot, no provision having been made to neutralise the acid formed.

Bergey[1] lists a *Strep. lactis var. distendens*, stated to have been obtained from a bulging can of evaporated milk, but he gives no differential characters. The same strain was tested again in this country by Allan,[2] who reports positive results with cans of evaporated milk, but who states[3] that exhaustive tests with special apparatus, for gas production *in vitro* gave negative results.

The Gram Negative Rod

This organism has proved impossible to identify with exactitude, but it presents all the characters of the common water types. As it forms copious gas from the sugars, including cane sugar with which the pudding is sweetened, the bulging of the cans caused by it is understandable.

It is a non-sporing, Gram negative rod form, of average size, highly filamentous in primary culture, but reverting permanently to even rods in subculture. No capsule is formed. It is actively motile. The optimum temperature is 22° C. (approx.), little or no growth occurs at 37° C., and the organism eventually dies out at this temperature. On agar a thick, moist, creamy, slightly fluorescent growth occurs rapidly, single colonies are entire and raised. No pellicle is formed on broth. In gelatin stab culture, crateriform liquefaction is definite in 24 hours, increasing rapidly and becoming strateriform, the medium is not discoloured except for the slight fluorescence, and there is no perceptible odour. Litmus milk is peptonised after a few days. Sugars are fermented as follows:

Lactose.	Maltose.	Dulcite.	Lævulose.	Mannite.	Glucose.	Saccharose.	Salicin.	Xylose.	Inulin.
—	AG	—	AG	AG	AG	AG	—	AG	—

Typical *B. fluorescens* ferments only glucose, and does not form gas. Information as to the differential reactions for the common water types is, however, scanty in the literature. The gas-producing groups appear to be those including common plant parasites—*e.g.*, *Erwinia* and *Phytomonos spp.* The organism under discussion has been tentatively classed as an atypical *fluorescens* type. In view of the fact that a water supply at the canning factory comes direct from a river without any preliminary treatment, this seems to suggest a source. This is further supported by the fact that this water is used for cooling the cans after sterilisation, and suggests the possibility of contamination through imperceptible and temporary leakage in some of the cans at this stage, as a partial vacuum tends to be formed inside the cans. Further, the sterilisation of the cans is carried out at 15 lbs. steam pressure, for 30 minutes, in a steriliser fitted with an agitating device so that the position of the cans is continually changing, and, taken with the fact that sporing organisms are always absent from the cans, this seems to preclude the possibility of contamination before sterilisation causing the trouble. At present only one sample of each of the water supplies at the factory has been examined with negative results.

The source of the *streptococcus* is still more obscure. The milk used is pasteurised, and the efficiency of the final sterilisation, as previously noted, would appear to rule out the milk as a likely source. Attempts to isolate this particular *streptococcus* from either the water supplies or the milk at various stages during the process have failed with the one set of samples taken. Unfortunately, it has not proved possible at this stage to carry out experimental sterilisation with artificially infected cans or other material under conditions similar to those pertaining in the factory steriliser. Further exhaustive investigations are necessary.

SUMMARY

(1) Bulging of cans of rice pudding was investigated and found to be due to a mixture of organisms, a *streptococcus* and a Gram negative rod.

(2) Attempts to identify either organism precisely were unsuccessful. The *streptococcus* appears to belong to the *Lactis-Fæcalis* group, and the Gram negative rod to the general group of water types.

(3) Attempts to elucidate the mechanism of the gas production by the *streptococcus* failed. The Gram negative rod produces gas by splitting sugar—in this case saccharose.

(4) The contamination of tins may occur after sterilisation, and the source, in the case of the Gram negative rods at least, may be a known polluted water supply which is used for cooling the tins.

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COLOUR IN POTATO CHIPS

AT the last meeting in Cincinnati of the Division of Agricultural Chemistry and Food Chemistry of the American Chemical Society, Dr. Norwood C. Thornton presented a paper which showed that the dark brown colour which potato chips sometimes assume during frying was due to too much reducing sugar, and not to sucrose as had previously been thought. Further light has been shed on the subject by a detailed paper by F. E. Denny and Norwood C. Thornton in the latest issue of the *Contributions from Boyce Thompson Institute*, Vol. 11, 1940, pp. 290-303: "Factors for colour in the production of potato chips." The problem was brought to the attention of the Institute by the research department of a food-distributing company, whose representatives reported difficulty in obtaining potato tubers that would furnish chips of a suitable colour, especially in late winter and early spring.

Differences in Varieties

Denny and Thompson found large differences among several American varieties with regard to the content of reducing sugar and the colour of the chips when fried. One variety of very low reducing sugar content gave chips that were almost or quite ivory-coloured after frying, while another was nearly as undesirable. Earlier work was confirmed that storage of potatoes at a temperature of 5° C., at which sprouting was inhibited, induced the formation of so much reducing sugar that chips from potatoes so stored were too dark; on the other hand, storage at 10° or above gave rise to sprouting if maintained too long. Hence, both the variety and the storage temperature have to be considered. The temperature of storage acts only indirectly—by bringing about the formation of more or less reducing sugar, always provided that it does not make the potatoes unusable; but, for that very reason, the importance of proper storage of potatoes intended for frying is very great if the customer's eye as well as his appetite is to be satisfied.

Effect of Frying Temperature

The way in which the desirable content of reducing sugar was established is interesting, and the original paper would repay study. Several carefully controlled frying temperatures were used extending from 302° F. to 464° F. It was found that the frying temperatures did not affect the colour of the chips, though it affected the length of time they took to attain their normal colour. For most of the tests an initial fat temperature of 383° F. was used, in which the chips were kept for 105 seconds.

A colour plate shows the results by means of photographs of specimen chips containing from 2 to 10 mg. of reducing sugar per ml. of juice (equal to about 1·6 to 8 mg. of reducing sugar per gm. of fresh tissue). The colour of the chips shows a regular gradation from too light at the lowest content of reducing sugar to too dark at the highest: the samples selected by the authors as being in their view most desirably coloured had 5 mg. of reducing sugar per ml. of juice (4 mg. per gm. of fresh potato). The optimum is, of course, a matter of personal preference, but probably chips from potatoes containing about that amount of reducing sugars would be generally acceptable.

Sucrose Content no Guide

Another column of the coloured plate shows a row of chips arranged in the order of their sucrose content. Here no regularity is perceptible, and it is clear that neither the sucrose content nor the content of total sugar is any guide in selecting potatoes able to give an attractive golden-brown colour when fried. The sucrose content can, however, be a factor in the browning, and becomes important if the temperature of cooking is sufficiently high; no doubt, at high temperatures, the cane sugar is broken down and forms substances able to brown.

The final test was made by preparing artificial "chips" from filter-paper strips stapled together, impregnated with various sugar solutions, and "fried" with a technique similar to that used for the real chips. In this way browning was obtained at fairly low temperatures from papers impregnated with dextrose, but not from those impregnated with sucrose or starch.

The results on potatoes were obtained from many varieties stored in many different ways—some at constant temperatures and others at alternating low and high temperatures. The effect of storage on the colour of chips fried from tubers that remained

(*Concluded on page 43*)

PROGRESS IN 1940

THE BAKING INDUSTRY

A further article in the series **Progress in 1940** *by the author of* **The Milling Industry,** *published in last issue.*

A. J. AMOS, Ph.D., B.Sc., F.I.C.

BREAD is, of course, a staple food of the country, and it was only to be expected, therefore, that various regulations would be introduced to control certain aspects of the baking industry during a state of war. The Government did not, however, exercise complete and direct control over the industry as it did over the milling industry, but it has imposed upon it various decrees which have greatly restricted the scope of the baker. The price of bread was "pegged" at a cost to the Exchequer of several millions sterling per annum. Efforts have, however, been made by the bakers to persuade the Ministry of Food to permit an increase in the price of bread, but the matter is still under consideration.

A comparatively recent Order—the Bread (Restrictions on Sales) Order, 1940—precludes the baker from selling any loaf, other than the Scottish loaf, except in the following shapes: one-piece tin loaf with not more than one cut, not more than one shape of a one-piece oven bottom loaf with not more than two cuts, a one-piece sandwich loaf and the shape known in Scotland as a one-piece batch loaf or a one-piece pan loaf. This regulation enforces that only one-piece loaves shall be made and further decrees that, except for 8-oz. Vienna loaves, rolls not exceeding 2 ozs. in weight, and fruitbread, all loaves must be of a weight of 1 lb. or an even number of pounds.

Another Order makes it an offence to place sugar, glucose or fondant upon the exterior of any cake, bun, pastry, etc. A subsequent amendment to this Order permitted the practice in the case of cakes intended for export.

Earlier in the year a regulation came into force which made it illegal to exchange stale bread for fresh. Consideration was also given to the practice of wrapping bread, and, because of the paper shortage, it was decided that all wrapping of bread should cease at the end of 1940. Whether or not an Order to this effect will become operative is, however, still in question. Millers were officially advised some time ago that, in order to deal with their security stocks, they should endeavour to make arrangements with suitable baker customers to store flour on their behalf. The flour was to remain the property of the miller, who was required to pay the baker a rental, a maximum figure for which was stipulated.

Considerable attention has been given to the best means of maintaining an adequate supply of bread in a state of emergency. For administrative purposes the country has been divided by the Ministry of Food into thirteen food divisions, and to each of these an Area Bread Officer has been appointed. In London an emergency organisation has been formed which is attached to the office of the London Divisional Food Officer, and which is supervised by the Chief Area Bread Officer. The Metropolitan Area has been divided into districts, for each of which a practical baker has been appointed Auxiliary Bread Officer. Circulars have been issued by the Ministry of Food which set out the steps which are advisable under conditions of emergency. In one of these advice is given as to the procedure to be adopted in the bakery before, during and after an air raid, whilst another publication describes how satisfactory fermentation can be maintained if fresh supplies of yeast are unobtainable or are not available in the usual quantities. Yeast manufacturers have prepared sufficient stocks to maintain adequate supplies in an emergency, and the reserve stocks have been placed in cold storage.

The Baking Trade Board, which attends to the interests of operatives in the industry, has recently decided upon an increase in the rate of war bonus paid to workers. The basic rates of pay remain unaltered, but the increased bonus has been proposed in order to meet the increased cost of living.

A recent development is the rationalisation of bread deliveries. The London area has been divided into zones, and any particular firm is permitted to deliver only in certain of these zones. One object of this scheme is the conservation of motor fuel by the prevention of vehicles from several firms touring the same district.

Shortly prior to the declaration of the war there was considerable agitation in the industry for the formation of a Research Association. Distinct progress had been made in the matter, and a Research Sub-Committee had been formed to investigate various possibilities. The work of this committee has, however, been suspended, but there is little doubt that once the war is over they will recommence their activities.

That the bakers as well as millers are awake to the possibilities that exist for meeting definite nutritional requirements of the community is revealed by the recent announcement that a firm of bakers is now producing a white loaf containing added vitamin B_1. Apparently this project has not been occasioned by the proposed Government scheme for the fortification of flour, but is the outcome of three years' investigation of this problem. Moreover, the bread in question has been brought to the level of wholemeal bread in vitamin B_1 content, whereas the Government's plan will stop short of this. The firm in question are not using synthetic vitamin B_1 for the enrichment of their loaf, but are employing a natural form of the compound.

Diastatic Activity

Jones (*Cer. Chem.*, **17,** 133) has published a paper embodying the conclusions which he furnished earlier to the milling industry of this country in three confidential bulletins of the Research Association of British Flour Millers. This work reveals that the mechanically damaged starch which is produced during milling is a governing factor in the diastatic activity of flour. An important conclusion in this paper is that with a given wheat sample the well-known and commonly employed maltose figure can be taken as a measure of the quantity of mechanically damaged starch cells resulting from any milling process.

Gortner and Hamalainen (*Cer. Chem.*, **17,** 378) have put forward the hypothesis that the variable susceptibility of raw starch to attack by diastatic enzymes may be partly due to the starch granules being more or less completely encased by a protein film.

When a starch solution is acted upon by beta-amylase, the hydrolysis proceeds rapidly until 50 to 60 per cent. of the starch is converted to maltose. Stamberg (*Cer. Chem.*, **17,** 372) investigated this phenomenon and came to the conclusion that the prevention of further action by the beta-amylase was not due to the phosphorus in the starch, but was explained by the structure of the carbohydrate in the residual erythrogranulose of the starch.

The difference between the actions of alpha- and beta-amylase on starch is of great importance in baking. A high beta-amylase activity, which results in the production of an appreciable quantity of maltose, is not necessarily detrimental if not accompanied by a high alpha-amylase activity, which leads to the production of excessive gummy dextrins. A high alpha-amylase activity is likely to give rise to stickiness and streaks in the crumb of the baked goods. The need for a test to differentiate between the activities of these two components of the diastatic enzyme complex was appreciated by Kent-Jones and Amos, who devised a method (*Cer. Chem.*, **17,** 265) for the determination of the alpha-amylase activity of flour. The figure obtained by this method they termed the "dextrin figure" of flour.

Dough Properties

Stamberg and Bailey (*Cer. Chem.*, **17,** 37) have devised an instrument for studying the plasticity of doughs. The dough, maintained at constant temperature, is extruded by means of air pressure through a small aperture in a cylinder, and the rate of flow is taken as an index of the relative plasticity. These workers find that the logarithm of the rate of flow is a linear function of the proportion of water used in making the dough. As is the case with all physical tests on dough, the temperature has to be precisely controlled during the experiment.

The question of the proportion of the water in dough which exists in the bound state has received further attention. Vail and Bailey (*Cer. Chem.*, **17,** 39) have devised a method of studying this problem which depends upon the di-electric proper-

ties. As a result of their work they conclude that the average figure for the proportion of the total water in a dough which exists in the bound state is 35·5 per cent. This figure is appreciably lower than the 51·4 per cent. found by Skovholt and Bailey (*Cer. Chem.*, **12**, 321) by means of the depression of the freezing-point method.

In recent years considerable attention has been given to the probable mode of action of flour improvers; a further contribution to this problem has been made by Ziegler (*Cer. Chem.*, **17**, 400), who suggests that the gradual action of potassium bromate as an improver is explained by its slow rate of oxidation of glutathione, which substance, according to Sullivan, Howe and Schmalz (*Cer. Chem.*, **13**, 665), is probably the main factor responsible for "low gradeness".

Several methods of assessing proteolytic activity, a flour property which influences dough behaviour, have been devised, and Landis (*Cer. Chem.*, **17**, 408) has now added another, which depends upon the use of the polarimeter. An infusion of the enzyme is incubated with a 2 per cent. solution of gelatin for five hours at a temperature of 40° C. and the mixture then cooled in ice-water. The optical rotation of the liquid is subsequently measured.

Storage Problems

It has long been known that the liability of milled products to develop mould growth upon storage is connected with the moisture content of the stock and of the surrounding atmosphere. Barton-Wright and Tomkins (*Cer. Chem.*, **17**, 332) systematically investigated this subject and concluded that the critical moisture content for fungal growth in flour is about 16 per cent. They point out, however, that, as this figure is near the danger point, a figure of 15 per cent. or less should be adopted in commercial practice, and, further, that it is advisable that the flour should be stored at a relative humidity not above 80 per cent. R.H. It will be noted that the maximum moisture content permitted for security stock flour by the Ministry of Food is 14 per cent.

Numerous investigations have been undertaken in the past into the phenomenon of the spontaneous heating of vegetable products during storage, and it has been made clear that the moisture content of the material is an important factor. Zeleny (*Cer. Chem.*, **17**, 29), working with maize, finds, however, that the rates at which samples undergo spontaneous heating under the conditions of his test can be predicted with much more accuracy when, in addition to the moisture content, the fat acidity is also taken into consideration.

The effect of various temperatures of storage upon the viability and baking properties of compressed yeast has been studied by Bailey, Bartram and Rowe (*Cer. Chem.*, **17**, 55). Their experiments suggest approximately 30° F. as the most suitable temperature for the storage of compressed yeast.

When wheat is harvested by the combine method, the "sweating" period in the shock which is considered as desirable for good bread-making quality is eliminated. Balls and Hale (*Cer. Chem.*, **17**, 490) found, however, that exposure of the wheat for three days to air containing one part in a thousand of ethylene leads to a hastening of the after-ripening process. Wheat not so treated required a month to attain the quality exhibited by the treated wheat after three days.

Bromine Content of Wheat and Flour

In view of the pre-war move to limit the addition of chemical substances to flour, investigations were undertaken into the natural bromine content of flour. Ford, Kent-Jones, Maiden and Spalding (*J.S.C.I.*, **59**, 177) reported the results of numerous determinations by modern methods of the bromine content of various foodstuffs, particularly flour and bread. They examined a number of flours guaranteed to be free from any chemical treatment and found they varied in bromine content from 2·4 to 7·7 p.p.m. Karman, Cattaneo and Viggiano (*Anal. Assoc. Quim. Argentina*, **28**, 59) examined a number of samples of Argentine wheat, flour and bran and found that their bromine contents varied considerably with the place of origin. They pointed out that numerous samples of bread contained more than 8·5 mg. of bromine per kilogram of dry bread, which figure had previously been regarded as the limit for freedom from potassium bromate.

Vitamin B_1

In view of the Government Order concerning the compulsory addition of vitamin B_1 to flour, it is of interest to note the findings of Aughey and Daniel (*J. Nutrit.*, **19**, 285) to the effect that the baking of a dough causes a 15 per cent. loss of the vitamin B_1 content.

Green has patented processes (*B.P.*, 522, 418) for the incorporation of synthetic vitamin B_1 in flour.

Wheat Bug Damage

Infestation of growing wheat by species of the wheat bug results in the damaged kernels containing an excess of a proteolytic liquid which, during fermentation, acts upon the gluten, causing it to become runny and sticky. Jones and Simpson (*B.P.*, 523, 116) have devised a method for remedying this defect which involves a short heat treatment at 70° to 100° C. It is claimed that wheat so treated suffers no detriment to the baking quality of the remainder of its endosperm and can be used in a blend similarly to undamaged wheat.

BAKING WITH POTATO PRODUCTS

TWO factories for producing potato flour or meal—the terms are synonymous—already exist in this country, and the Government is having several others erected. So far as this country is concerned the use of potato flour in baking is an innovation, although it is a well-known Continental practice. Potato starch (farina) may also be pressed into service in the baking industry to supplement the supply of wheat flour. The difference between potato flour and farina is that the flour contains the fibre of the tubers, whereas farina is the starch from which all fibrous matter has been rigidly eliminated.

Baking Mixtures

Owing to the entire absence of gluten in potato flour or starch, these products do not possess the strength of the various grades of wheat flour, and in general it is not advisable to add more than 10 per cent. of these potato products to flour mixings for such things as scones, buns, puff pastry, and similar goods in which a strong flour is required. But when a relatively soft flour is called for up to about 20 per cent. of potato flour or farina may be included in the flour mixture, as in the making of cakes, shortbread, ginger-bread, etc. For bread making up to about 20 per cent. of potato products may be added without appreciably affecting the characteristic properties of the loaf. The colour of the latter is not affected if up to 50 per cent. of potato products is used, but this proportion alters the flavour of the bread considerably. As potato flour and farina are essentially of a weak nature they do not blend very successfully with English wheat flours, since these latter are generally both weak and of poor colour, and the characteristic nutty flavour of bread made from English wheat appears to emphasise the harsh flavour of both potato flour and farina. But blends of potato products with such wheat flours as Canadian, Indian or Russian have been proved to be very successful if no more than the correct proportions of the potato products is used.

Some Recipes

The following are intended as a rough guide to those using potato products for the first time, but real success with these comes only to those who persevere and try out varying mixtures to suit their own conditions and the flour available. Cake Mixture: Wheat flour 300 lbs., potato flour or farina 100 lbs., baking powder 25 lbs., sugar 320 lbs., salt 20 ozs., with suitable flavouring. Spongecake Mixture consists of the following: Wheat flour 200 lbs., farina 40 lbs., sugar 200 lbs., cream of tartar 10 lbs., bicarbonate of soda 9 lbs.

Although in general potato products are best used in admixture with wheat flour, there are certain classes of goods which can be produced fairly well without any wheat flour addition. The following three recipes have long been in use in Continental bakeries, and the ingredients are mixed in the usual manner. Almond Cake: Egg powder 25 lbs., sugar 75 lbs., sweet almonds 31 lbs., bitter almonds 6 lbs., potato flour 150 lbs., flavour with lemon juice or substitute. Pancakes: Egg powder 9 lbs., potato flour 200 lbs., make into a thin paste with skimmed milk. Sweet Biscuits: Egg powder 13 lbs., sugar 50 lbs., potato flour 150 lbs., with suitable flavouring. In all the above recipes, of course, some kind of fat is required, which may be one of the compound cooking fats or margarine.

The absorbing power of both potato flour and farina compares favourably with that of wheat flours, although with the latter one generally assumes that good absorbing power means a high gluten and a low moisture content. Since potato products possess no gluten and a higher moisture content (about 18 per cent.) than wheat flours, one must ascribe this good absorbing power to the properties of the potato starch itself.

THE KEEPING QUALITIES OF CHEESE AND OTHER MILK PRODUCTS

H. D. MURRAY, M.A., F.I.C., and A. TYRRELL

FRESH MILK has long been recognised as a highly desirable constituent of a well-balanced diet, both in its natural state and, to a lesser extent, in the form of its various products. These have a special value at the present time, when it is essential that the utilisation of home-produced milk for food should be as complete as possible. It may be of interest, therefore, to consider the factors which affect the keeping qualities of these milk products.

Rendering Milk Stable

Since milk contains a high proportion of water, storage of its solid constituents may be economically effected (1) by withdrawing the water under conditions where the natural balance of the solid constituents is altered as little as possible, (2) by withdrawing water and some of the other constituents so as to yield an altered product susceptible of storage over considerable periods without further elaborate precautions. These operations introduce the following problems: (*a*) The method whereby the concentration is to be effected, whether by physical or by chemical means; (*b*) the preservation of a high food value in a desirable form; (*c*) the production of a material capable of storage without further undesirable changes, and especially of a type having a high resistance to attack by micro-organisms. As has been indicated above, milk products fall into two classes: (1) Concentrated milks; evaporated, dried and condensed whole or skim milks, in which the balance of food constituents remains largely unaltered. (2) Cream, butter and cheese. These are partial or nearly complete separations of the milk into its constituents, the first two being stages in the preparation of the practically 100 per cent. butter fat, the last containing the majority of the casein and no milk sugar.

Where, as in class (2), some constituents are removed from the milk, the separation is by no means complete, and, except in extreme cases, such as "butter oil", the particular product is characterised rather by a disturbance of the milk's previous balance than by a complete extraction or isolation of one material. This is clearly shown in the figure.

The only products maintaining the food balance of the original milk are evaporated, dried and condensed milk. Cream maintains the milk balance with, of course, a substantial increase in the fat content. In view of transport difficulties and lack of refrigeration at the present time, cream can best be regarded as an intermediate stage in the preparation of butter, which differs from cream in that solids (other than fat) and water have been removed. Butter may be made from whole milk without reducing the usefulness of the skim milk or of the buttermilk left when cream is churned. Butter is a relatively stable material and is almost entirely milk fat.

The uses of skimmed milk are similar to those of whole milk. It may be evaporated, sweetened or dried, but the market for each of these products is limited. It may be "fermented" to give therapeutic products, or it may be precipitated with rennet or acid to give casein. The whey resulting from the last procedure yields lactose. Butter, casein and lactose are relatively complete separations of the fat protein and sugar of the original milk. Casein and lactose as such are of little interest to the domestic consumer.

Cheese

The only product not so far considered is cheese. The figure clearly shows the derivation of the many varieties of cheese from either whole milk or skim or butter milk. The two latter are approximately equivalent; butter churning might almost be regarded as a completion of the skimming of milk, and this results in the return of the skim milk carried over with the cream during the first separation.

It is apparent that, in passing from milk to cheese, the food balance of the milk is considerably altered. Lactose is almost entirely removed in the precipitation of the cheese curd, some reappearing in the cheese as lactic acid, the majority remaining in solution in the cheese whey.

From the point of view of the usefulness of cheese as a milk product, however, this loss to the cheese of lactose is to be offset by the great keeping qualities which many types of cheese possess as compared with milk, cream or butter. Under favourable storage conditions a hard cheese, such as Cheddar, may be kept for a year or more. Of significance now with regard to cheese is the fat-protein ratio. These are here listed with the same ratio of the milks from which cheese could be made.

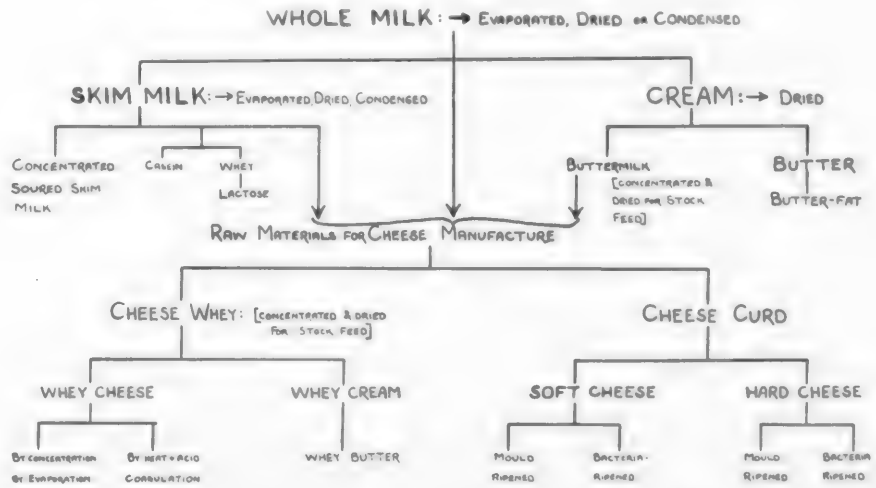

Diagram showing the By-products of Whole Milk.

Fat: Protein Ratios

Cow's milk	1 : 0·8	Brick cheese ...	1 : 0·71
Skim milk	1 : 0·25	Camembert cheese ...	1 : 0·74
Buttermilk	1 : 0·33	Limburger cheese ...	1 : 0·89
Parmesan cheese ...	1 : 0·44	Neufchatel cheese ...	1 : 0·77
Swiss cheese ...	1 : 0·55	Cream cheese ...	1 : 0·31
Cheddar cheese ...	1 : 0·71	Cottage cheese ...	1 : 0·1

It is convenient here to refer to the " minor constituents " of milk; these are but small percentages of both organic and inorganic substances (the latter largely appearing as " ash " in the analysis) which may be of considerable importance owing to effects exerted. Values for the composition of the ash of milk are of the following order :[5]

	Per Cent.
K_2O	25
CaO	20
Na_2O	10
MgO	2·5
Fe_2O_3	0·1
P_2O_5	24
Cl	14·4
So_3	4

The method of manufacture of the cheese may result in a considerable modification of these figures.

Cheese may be made from normal (" whole " milk), from milk skimmed to varying degrees, or (rarely) from whole milk to which has been added cream. The product of the manufacturing process may be regarded as a casein containing varying amounts of fat and other milk constituents, usually with the exception of lactose. Cheese may range in hardness from Parmesan (the hardest) to the soft and unripened type (cottage, etc.). The latter have been included in the present discussion for completeness, but their properties remove them from consideration as a stabilised form of milk. Their manufacture is attended with some difficulty, good quality milk and especial precautions being necessary, together with low-temperature storage during a short marketing period to avoid spoilage from moulds and bacterial growth.

Methods of Manufacture

All cheese other than soft is made by modifications of the one process :

(i) The production of curd by the action of rennet or of acid-producing bacteria;

(ii) the separation of the curd from the whey; and

(iii) the setting and ripening of the raw cheese under controlled conditions.

A great variety of cheese is obtained by variation of these steps; it is of interest to note that, apart from the different *physical* properties of the curds obtained either by rennet or by " ferment ", other significant changes may take place at this stage.

The use of acid-producing bacteria to produce coagulation results in a whey having a considerable acidity. As is shown later, the development of acid is important as affecting the keeping qualities of the finished cheese; it must, however, also be borne in mind that hitherto insoluble salts are rendered soluble by the acid liquid, and are hence lost to the cheese. This is particularly so if the curd is washed. A rennet-produced curd, on the other hand, carries down with it the majority of the insoluble salts originally present in the milk, being almost neutral in reaction. This also renders the rennet curd capable of supporting the growth of a much larger variety of micro-organisms than the high-acid curd, and hence favours the production (under rigorously controlled conditions) of a greater variety of flavours. It also renders the cheese, unless precautions are taken, more liable to the development of bacterial and other faults.

In considering the keeping qualities of cheese, the acidity, or, rather, the hydrogen-ion concentration, is of considerable significance. In its normal life history cheese shows a cycle of hydrogen-ion change, from the first production of curd to the ripened cheese. In the manufacture of Cheddar cheese, for example, the *p*H falls in 24 hours from a figure of 6·5 to 6·6 for the milk used to a figure between 5·3 and 5·9. The *p*H then slowly rises again, so that a fully ripened cheese may show a figure as high as 6·0. It has been found that cheese of inferior quality results when the hydrogen-ion concentration is excessive at any given stage of manufacture.[1]

In the normal hydrogen-ion cycle the growth of one micro-organism in the cheese, by influencing the *p*H of its environment, may pave the way for the rise and development of other micro-organisms.

Use of Starters

In the production of hard cheese it is customary to add milk cultures of lactic acid-producing bacteria prior to coagulation. Such starters provide the requisite acidity for the production of curd of suitable texture, through the conversion of lactose into lactic acid by the lacto-bacilli present in the starter. Moreover, the flavour and quality of the ripened cheese depend largely upon the vigour and purity of these cultures, which are renewed from day to day and year to year.

Upon occasion, the normal life history of cheese may be changed, either by the growth of undesirable types of organisms present in the milk or by infection by alien organisms, and such change may be apparent both in the flavour and in the texture of the cheese.[3]

Where a starter is employed, the milk may be pasteurised so as to lessen the possibility of the first eventuality.[4] This process has been employed extensively for some years in New Zealand.

It appears that the growth of undesirable organisms, whether coming from within or from without, is favoured by failure to establish or maintain the *p*H requisite for the optimum growth of the organisms associated with each stage of the normal ripening process.

In this connection it is known that milk acids are only partially dissociated, and it is for this reason that *p*H is of significance rather than titratable acidity. *p*H may be measured by quinhydrone or glass electrodes of brown types.

The Ripening Period

In cheese ripening it is normal for the *p*H to rise as changes take place in bacterial growth. The so-called processing of cheese is an attempt to stabilise cheese in a ripe condition by pasteurisation and by certain modifications in physical condition. It follows that, for the process to be successful, the *p*H of the pasteurised product must be such as to discourage the further growth of those organisms which may survive the pasteurising process. This *p*H level appears to be about 5·2 to 5·4.

The mechanism of cheese processing is as follows. Good quality cheese is freed from rind. After milling and blending the raw material is cooked to a temperature sufficiently high to produce pasteurisation. The product is then packed mechanically in metal foil containers under conditions which approach ascepticity, and is cooled and packaged. During the process of cooking a small quantity of water may be added to give a product of uniform moisture content, together with some 0·5 to 3·0 per cent. of an inorganic salt, such as sodium phosphate or sodium citrate, so as to promote emulsification and to give a smooth and uniform product.

The temperature to which processed cheese is taken during the operation of emulsification varies from 150° to 180° C. Most micro-organisms are killed, but certain thermophylic organisms and certain spores may survive the process. The influence of *p*H in such pasteurising processes has recently been emphasised.[2] The *p*H of the product during emulsification is controlled by that of the raw cheese and by the nature of the emulsifying salt.

As has been said, the processing of cheese may be regarded for practical purposes as an attempt to stabilise the raw cheese in a condition of maturity so that the material can be distributed and marketed over long periods without change. In so far as the product is palatable, and little or no further micro-organic growth occurs, the operation of processing may be regarded as successful.

Much of the relationship between *p*H and micro-organic growth may be studied in the laboratory by the use of synthetic media buffered to definite *p*H levels. In addition to the usual media, a synthetic malt extract serves for the growth of moulds and yeasts, and a yeast-dextrose broth for the culture of thermophylic organisms at 60° C. Isolated strains may be sub-cultured on to sterile cheese emulsions, again buffered to suitable *p*H levels.

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CORRESPONDENCE

Price Regulations—Vitamin B^1 in Bread—Fruit Packing in 1940

The Editor.

DEAR SIR,

Whilst the great majority of reputable manufacturers of food products are in complete favour of price regulation or control, we really cannot see how the proposed Price Regulation Order can operate at all on a price based six weeks ago.

We, as manufacturers of pickles, sauces, etc., quote below a few figures that should more than prove our complete inability to still offer our products at the December 2 price.

Articles listed are absolute essentials in the manufacture of our products.

Bottles, Jars, etc.—From the end of November prices were advanced a further 10 per cent., making a total of 20 per cent. since September, 1939.

Red Cabbage.—From August to the end of November of last year we never paid more than £16 per ton for this commodity, but during the month of December prices advanced to as much as £25 per ton. The average price before the war was between £5 and £10 per ton.

Mustard.—On December 19 we called for a supply of the above, which was charged to us at the rate of £82 per ton. Previous figure for this line (which was still higher than pre-war) was £65 per ton.

Vinegar.—This vital material was advanced by approximately 20 per cent. towards the end of November.

Caps and Bungs.—These lines are never staple and have been subjected to many increases during the past 12 months. Some metal caps have advanced by more than 100 per cent. over this period.

Spices and Condiments.—Whilst stocks may have been fairly large, it is absolutely impossible for us to replace these at anything near the original purchase figure, and each week prices may change, but always in the upward direction.

Ground Rice.—Price last paid was 24s. 6d. per cwt. Previously anything from 15s. to 18s. was the figure asked.

Wages.—A further proposal (which is bound to become operative) for increase in wages has been issued by the Trade Boards, the ruling body in the sugar, confectionery and food preserving trade.

Sundry increases of incidental necessities are too numerous for us to list here.

Thus it will be realised that prices operating on December 2 (from the manufacturer's standpoint) were in respect of goods produced from materials that may have been purchased a month or even three or more months prior to that date. How, therefore, is it possible to control prices in such an unfair and definitely harmful way?

If there is to be a control of any manufactured product, then of necessity there must be control of all the components of the product, which, obviously, must also include wages.

This is a matter of grave concern to our trade and allied trades generally, and we feel we are not alone in the views we have expressed herein.

Yours faithfully,
C. MCENERY,
Pp. Macks (Walsall), Ltd.,
Managing Director.

P.S.—Sugar was advanced on January 1 by 9s. cwt. to manufacturers *only*.

* * *

The Editor.

DEAR SIR,

I do not wish to prolong indefinitely, even if you were to allow me to do so, my discussion with Mr. H. Horace Ward. Will you, however, permit me to comment that our difference seems to be due to a difference in aim? I don't know what Mr. Ward means by "the minimum daily intake required" of vitamin B_1 or of anything else. I myself was rather lax in using the phrase "amount necessary for health", but I have made my position in this matter sufficiently clear in a paper on "The Composition of Marginal and Optimal Diets" published jointly with Professor J. C. Drummond at the beginning of last year (*Jour. Soc. Chem. Ind.*, 1940, **59**, 37). Drummond and I considered—and still consider—that 1 mg. of aneurin, 330 units, is the average daily marginal requirement, but is quite certainly not sufficient for the maintenance of complete health. It is because authors do not define with sufficient accuracy whether they are speaking of marginal or optimal requirements, and use terms like minimum and average, two authors often using the same term in different senses, that so much confusion has arisen about adult requirements. I do not deny—who could?—that the Ministry's proposals will bring up the intake of the manual labourer, if he eats a pound of bread daily, from about 100 units to 250 units, and that this is in itself a good thing, if it is not balanced by greater evils. Mr. Ward is of opinion that such a labourer would be obtaining 200 units from other sources. I can only add that I rather doubt this; I endeavoured to show the reasons for this doubt in my last letter.

Yours, etc.,
A. L. BACHARACH.

* * *

The Editor.

DEAR SIR,

There is not very much to record on the subject of fruit packing during the last year.

There is a swing over to cardboard containers, and manufacturers are in for a good time if they will be able to supply the goods, which must become more difficult as time goes on. One firm have brought out a half-bushel container for apples which is quite the best I have seen so far. Packing has reverted to returnables, and the non-returnable is no longer existent in wood owing to the restrictions on this material.

Fruit growers are augmenting their production by interplanting with vegetables whenever possible. This will go a long way to help during the winter. Apples are rapidly becoming more scarce, as the Bramley crop is much less than usual (quite two-thirds), and only those held in gas stores now remain, whereas a year ago hundreds of bushels were still on hand on most farms at the same time of year. This is to be expected after a glut crop. The bud is not too promising for next season either, but this does not matter so much if the setting period is good.

Personally I think that several orchards of old trees might be taken out to advantage, as these are no longer of much use, and corn could be planted to much greater advantage; also in the long run it would be a good thing for the industry, seeing that the old varieties are normally unsaleable. This point is certainly worth stressing, as it is important, and it would affect hundreds of acres in old fruit-growing counties like Kent, Hereford, and Worcestershire.

(Signed)
T. H. BRUNT.

CAVIAR IN CANADA

STURGEON in Canada's lakes and rivers have a place in the war effort, and this year they will be responsible for purchase of at least a part of a warplane. In other words, according to Fisheries Department experts, Canada has a good market for caviar in the United States.

If Ontario production is up as it is reported to be in Manitoba, the Dominion will get at least $7,000 in United States money to use for war buying. Caviar usually sells for $1 a pound, and this year prices are rising.

Two factors enter into this tasty situation. First, there are the prospects of a shortage for caviar-eaters in the United States, because the war has interfered with importations from Russia. Second, Manitoba expects to ship to the United States this year more than 2,400 lbs. of the delectable little fish eggs, 900 lbs. more than last year. Last year Manitoba shipped 1,512 lbs. and Ontario sent 4,870 lbs. to the United States. These two provinces are the big Canadian producers.

FOOD MANUFACTURE INDEX FOR 1940

THE 1940 index of FOOD MANUFACTURE is now ready, and copies will be available to subscribers on receipt of a stamped addressed envelope. This envelope should be 10 inches by 8 inches to avoid undue folding of the Index.

FROZEN MILK

Webb and Hall were among the first to suggest the concentration and freezing of milk as a means of preserving the product for a period of several weeks, and their results indicate that fluid milk can be concentrated to one-third of its volume, sealed in containers, frozen without agitation at a temperature of about 0° F., held for about five weeks and thawed and reconstituted to fluid consistency without noticeably impairing the quality of the product for use as fluid milk.

This procedure has been suggested as a means of furnishing milk to territories which at present are without an adequate or satisfactory supply of fresh fluid milk. The United States Bureau of Dairy Industry has announced that trial shipments of concentrated frozen milk to the Canal Zone have been made with conspicuous success. There are undoubtedly other potential uses for the process where it is desired to hold milk over a limited period of time in a manner which will change its properties and characteristics to the least possible degree. It is obvious that this method has decided advantages, in this respect, over the conversion of the milk to be held into such storage products as sweetened condensed milk, evaporated milk, dry milk, etc. The period of time it can be held, however, is limited and the cost of holding (under refrigeration) will necessarily be greater.

It was the purpose of this study to observe the effect of the following factors on the quality of reconstituted, concentrated frozen whole milk :

(*a*) Degree of concentration.
(*b*) Homogenisation.
(*c*) Length of holding period.
(*d*) Temperature of thawing.

Fresh whole milk is pasteurised at 145° F. for 30 minutes, condensed in a small vacuum pan, standardised if required, cooled to 40° F., placed in two-quart cans and set in a refrigerator having an average temperature of — 10° F. until removed for examination and reconstitution. The homogenised samples were processed at 2,000 lbs. following pasteurisation and preceding concentration.

All the samples (1, fluid; 2, concentrated; 3, concentrated, frozen, held and thawed; and 4, concentrated, frozen, held, thawed and reconstituted) were examined for flavour, per cent. of acidity, creaming ability, de-emulsified fat stability in boiling water, appearance of fat separation and curd tension.

Flavour was determined organoleptically : acidity by titration in the usual way ; creaming ability by allowing the reconstituted sample to stand in 100 ml. cylinders at 40° F. for 24 hours ; de-emulsified fat by a method similar to that used by Webb and Hall except that Babcock milk bottles were used and the samples examined after reconstitution ; stability in boiling water by adding a few drops of the sample to boiling water in a test tube ; and appearance of fat separation by visual examination.

Four different lots of whole milk were concentrated approximately 2 to 1, 3 to 1, and 4 to 1 respectively after pasteurising. Samples of each concentration were placed in tins and frozen. They were held for four weeks in the frozen state and then thawed at room temperature and reconstituted.

The data obtained indicated that milk may be frozen after concentration and held at low temperature for periods up to four weeks without greatly changing its characteristics and general quality. A concentration of about 3 to 1 appears to give the best results, as was pointed out by Webb and Hall. Samples concentrated less than this showed pronounced fat separation after reconstituting, while those concentrated more than 3 to 1 were very viscous and difficult to thaw and reconstitute because of excessive lactose crystallisation. Tallowy flavour was noted in most of the held samples and probably would be a factor to contend with if the method is to be used commercially. In these trials winter milk was used and the copper coils of the vacuum pan were a factor which could not readily be eliminated. None of the samples showed evidence of denaturation of the protein during thawing, although Webb and Hall found these to occur in milk condensed 4 to 1 in as little as five days of holding in the frozen state.

In two trials the original milk was divided into two lots. One was homogenised after pasteurisation and before condensation and both lots were examined in the fluid state, immediately after concentrating and again after freezing and holding for four weeks.

The data obtained indicate that homogenisation of the milk prior to concentration and freezing gives a final reconstituted product that is smoother in texture and which exhibits less de-emulsified fat than when homogenisation is not used. On the other hand, homogenisation completely destroys the creaming ability of the reconstituted milk. Since the creaming ability is always impaired by concentration, freezing and holding, and since the cream layer which does form on unhomogenised, frozen reconstituted milk is in many cases more in the nature of a cream plug, a homogeneous final fluid milk is probably an advantage rather than a disadvantage.

Homogenisation also appears to inhibit the development of tallowy flavour in frozen concentrated milk. This has been noted in other products by several investigators.

The curd tension of milk is reduced very considerably by pasteurising and concentration. It is further reduced by homogenising and still further by freezing and holding. In the two trials made the reconstituted milk from the homogenised lots, after four weeks of holding, had curd tension of 0 grams and 7 grams respectively, whereas the original raw milk gave values of 58 grams and 47 grams respectively. This reduction is almost as pronounced as that obtained in reconstituted evaporated milk.

Two different samples of milk were pasteurised, homogenised, concentrated to ratios of 3·20 and 3·33 respectively, frozen and held for periods of 5, 6, 7, 8 and 12 weeks before thawing at room temperature, reconstitution and examination.

Sample 1 did not show denaturation of the protein until after being held frozen for a period of 8 weeks, at which time a slight tendency towards gelation during thawing was evident. This became pronounced at 12 weeks. The gelation made reconstitution difficult in cold water, but with time and sufficient agitation a normal appearing reconstituted milk was obtained.

Sample 2 contained a fine coagulum when thawed at 5 weeks which became more pronounced with longer holding. The typical gelatine, however, did not appear until after 12 weeks of holding. This sample would not produce a normal appearing milk when reconstituted in cold water. The flakes of curd persisted after prolonged agitation and settled to the bottom on standing. (*The Milk Messenger.*)

MINISTRY OF FOOD

Extension of Price Control

The Ministry of Food announces that it has been decided to extend considerably the field of price control.

Hitherto Maximum Price Orders have been issued only for essential foods and for a few others for which, for some special reasons, it was considered desirable to regulate prices.

Although the great majority of food traders have kept prices of uncontrolled foods at a reasonable level, there has recently been evidence of some speculation in such food products, sometimes by firms which do not usually handle them. It has, therefore, been decided to prepare a considerable number of additional Maximum Price Orders. The preparation of these Orders will involve consultation with the different sections of the trades concerned, and some time must elapse before they can be issued.

As an interim measure an Order has been made, which came into operation on Monday, January 13, covering the following foods :

Coffee (including coffee essence and "coffee and chicory").
Cocoa powder; Cocoa butter.
Chocolate sold for use as a beverage.
Canned and bottled vegetables.
Canned pork and beans.
Honey.
Meat pastes, and fish, poultry and other edible pastes.
Meat and other edible extracts.
Shredded suet.
Dead poultry (other than turkeys).
Rice; Tapioca and sagos.
Macaroni, spaghetti and vermicelli.
Biscuits, rusks and crisp breads.
Soups, tinned, bottled and powdered.
Processed cheese.
Pickles, sauces and relishes.
Custard and blancmange powders; table jellies.
Edible nuts.
Syrup; treacle; marmalades.
Jams, other than those covered by the existing Order.
Canned and bottled fruits.
Canned fish, other than canned salmon.

The Order makes it an offence for any manufacturer, wholesaler, retailer or other dealer to sell any of the foods mentioned at a price higher than he charged on December 2, 1940.

The practicability of applying price control to some other food products is under examination.

GULL EGGS AS FOOD

ERIC HARDY, F.Z.S.

An important aspect of the suggested collection of gull eggs for food is the refuting of the belief that the 1914-1918 war use of these eggs depleted the numbers of gulls and dispersed their gulleries over a wider area.

Three adjacent nests of the Black-headed Gull.

DURING the last war considerable use was made by the food industry of wild gull eggs as a substitute for ordinary poultry eggs in the inevitable shortage of supplies of the latter. Although the cooking value of the gull egg remains the same, other conditions have differed so that there will be a much greater desire to utilise such substitutes when they are available in the spring.

The Black-headed Gull

The foodstuffs problem is bound to make home egg production more difficult than during the last war, but in the past decade the black-headed gull, whose eggs are most convenient for collection and transport on a commercial scale, has considerably increased its numbers and formed many more nesting colonies in the north of the country, many with a strength of over a thousand pairs of birds, producing about 4,000 eggs. Naturalists can see no harm from an organised collecting of these eggs because, with its increasing numbers, the black-headed gull has seriously prejudiced the haunts of many terns and rarer birds, and there is every desire to curb its increase. The legal position protects the adult birds from shooting, but collection of their eggs is not covered in the same way as those of the lapwing plover, and contracts for egg-collecting are merely a matter for the local landowner. In many cases like Ravenglass, the largest English gullery, with an annual nesting population of some 60,000 birds laying 240,000 eggs, the gulleries are within close proximity to a railway station, and eggs could be collected under piece-work rates, or by estate servants, in large hampers, as for years herring-gull and guillemot eggs have been harvested from the Yorkshire cliffs and sold in the markets at Bridlington and Flamborough.

The bulk of the collecting would have to be conducted in May; owing to the open position of the nests, it should be easier and quicker than collecting from a modern multiple poultry farm, and three or four harvestings should suffice to gather fresh eggs within a day of laying. Late eggs after this could be left for the birds to hatch out and maintain their colonies. If the eggs are gathered shortly after laying, the birds will generally lay again.

The egg of the black-headed gull is smaller than those of the herring gulls and guillemots sold at Bridlington, but considerably more numerous. Its average size is 2·2 inches by 1·46 inches, the numbers in the clutch vary from two to four eggs—generally three—and early layings begin in April, the bulk, however, early in May. Other gull eggs are: Lesser black-backed gull, with many colonies on northern heaths, and herring-gull, common on cliffs, both 2·7 inches by 1·9 inches.

Gull Population

A recent national census of the black-headed gull population showed that there are some 70,000 nesting pairs at 124 gulleries in England, 6,000 at 34 gulleries in Wales, and at least 100,000 at 145 gulleries in Scotland. The very small colonies and the isolated ones on high, lonely moorland in North Wales and Scotland would probably not prove a commercial proposition except for local use, but at a very conservative estimate more than 75 per cent. of the annual lay of over half a million eggs should be available for food. In the last war the industry had little or no help and had to rely upon the indiscriminate collecting of local natives. There is now time to negotiate with the landowners for contracts for the 1941 eggs so that a large supply can be assured at collecting depôts which the industry could establish in the areas of the main gulleries, and at the same time render bird conservation a service in reducing the numbers of a predatory species already too numerous in the country. Care should be taken to exclude the eggs of terns and other rare birds which may be nesting in the vicinity, and upon this point any simple bird book, the voluntary help of any local bird society or naturalist, or the estate keepers would quickly show the difference.

Where Gulls Congregate

The larger part of the gull population is in the north of England and Scotland, and transport difficulties should be no more than with rabbits or many farm products. There are no black-headed gulleries in the Isle of Man and very few in the Bristol Channel region. In some cases colonies may be smaller than the census figure owing to troop training or shore defences near the dunes where they nest, but on the whole the gulleries accommodate themselves to the changing conditions providing they are not shot at. These gulleries are not all at the seaside, and many exist at inland places twenty miles or more from the sea, a characteristic which adds to the convenience of commercialising the black-headed gull. New and branch colonies continue to be formed each year, and there are probably 500 gulleries altogether in the British Isles. One interesting result of the recent census was the refuting of the belief that the 1914-1918 war use of these eggs for food depleted the numbers of the gulls and dispersed their colonies over a wider area. Cumberland and Yorkshire remain the two richest English counties for these gulls, the former with nineteen gulleries, chiefly along the Solway, and the latter with twenty-nine.

Colour in Potato Chips

(*Continued from page* 36)

in saleable condition after the different modes of storage was expressed by its effect on the amount of reducing sugar. This, then, is the governing factor, and, for American potato varieties at least, it seems to be sufficient for the fryer to determine the content of reducing sugars in the potatoes as received, in order to assure himself whether the chips will or will not be of pleasing colour. Work remains to be done to see whether this finding also holds good with British and other varieties.

Another possibility, which does not seem to have been explored, is the use of the methyl ester of α-naphthalene-acetic acid to inhibit sprouting, and thus to permit storage at relatively high temperatures such as are favourable to the maintenance of a low content of free sugars in the tubers.

Book Reviews

HEALTHY EATING

"Herein lies what I believe about dietetics after I have dragged myself through the journals, the textbooks, and the libraries devoted to that subject, and after I have practised more or less for twenty years what I preach."—PROFESSOR MOTTRAM.

WHEN the author of a book on food states that his aim is to the normal or slightly abnormal lay member of the middle classes one wonders what to do about it. From whose standpoint should a review be written? We are most of us middle class, but who will admit to slight abnormality when it comes to the point? Many of us are laymen, and it is difficult for such to disagree with the expert (especially one of the eminence of Professor Mottram), and so the job is apparently one for the expert.

As soon as the layman becomes the expert he tends to lose the capacity for appreciating the layman's angle of view. However, all these difficulties disappear when considering Professor Mottram's little book,* and some of his drastic "debunking" of persistent beliefs may produce somewhat of a shock to some experts themselves.

Events move so quickly nowadays that some of the recommendations regarding proper diet are for the time being impracticable. An example of this is the method by which vitamin C may be obtained. At the time of writing, oranges, lemons, bananas had not practically disappeared from the shops, and it is noted that Professor Mottram's P ii Group, mainly containing vitamin C, is "questionably" contained in cooked green vegetables. But there is given one "rigid economy" menu for middle-class folk in which the citrus fruits are absent, which shows how it is possible "to get round" these. It is as follows:

Breakfast:
Bread and milk;
Bacon, herrings, herring roe or pig's fry;
Toast or scrunch (scrunch is left-over pieces of bread baked brown in the oven);
Treacle and vitaminised margarine;
Tea.

Mid-morning:
Milk and biscuit or milk and buttered scrunch.

Lunch:
Bread and cheese;
Watercress, mustard and cress;
Bread, vitaminised margarine, golden syrup.

Tea:
Tea, bread and butter.

Evening Meal:
Cold meat and raw cabbage and turnip salad; or
Roast mutton, boiled potatoes and greens; or
Home-made "pork" and beans;
Bread or scrunch, vitaminised margarine and a cheap home-made jam.
(Or if the pint of milk per head has not been consumed, milk pudding or milk or cocoa to drink.)

In writing on the amount of calcium lost in cooking green vegetables, he says that the amount is 6 milligrammes from two helpings, whereas the daily requirement is 600 milligrammes. Professor Mottram declares that many of us are suffering from vitamin C deficiency, but does not seem to attach much importance to "cabbage water". If the figures given by Olliver (*Lancet*, August 17, 1940) may be taken as correct, 63 per cent. of ascorbic acid is extracted in the cooking of cabbage, 16 per cent. is destroyed and 21 per cent. retained, and the figures for sprouts are approximately the same—surely an argument for utilising the water extracts as soups, etc. The alternative—eating raw vegetables—is not for all digestions, although we must tread warily here, as Professor Mottram has a lot to say on mistaken beliefs about the digestibility of foods. In a chain of milk shops in Buenos Aires (they discovered milk bars years before we did) there is displayed in large print behind the bars the legend which, translated from the Spanish, reads:

"DRINK YOUR MILK IN SMALL SIPS".

It seems that if you do that you get a "nice, tightly wound golf- or cricket-ball effect in your insides", so you had better gulp it down and let it clot as a whole. Raw eggs are not more digestible than boiled eggs, and so on. However, Professor Mottram, in giving a complete list of indigestible and digestible forms of food, does so with provisos which may be summed up in the phrase "One man's meat is another man's poison", which covers a multitude of things.

There was a gentleman who, up to a short time ago, ran a "Nature Cure Clinic" near Harley Street and fed all his patients on bran. He was what would be called the "roughage fiend", and probably provided his surgeon colleagues in the next street with some interesting appendicitis cases. The present reviewer remembers a sprightly young woman of some sixty summers, arriving in New Zealand from California to conduct mass "nature cure" classes from Auckland to Dunedin at three guineas a head, and a very good thing she made out of it. About 200 "students" industriously took notes of pseudo-chemistry; about unrefined salt, brown sugar and all the rest of the "natural" things. One of the lecturer's maxims (for herself) was "make 'em laugh", and, in passing, it may be mentioned that Professor Mottram does not disdain the help of humour in the dissemination of his doctrines. The present reviewer does not wish to be too hard on the lady from California, as she taught him some excellent breathing exercises which, for some months, took the terrors from two daily climbs of an almost perpendicular cliff, 400 feet high, in a desert island in the Pacific Ocean.

Professor Mottram has little mercy upon the food cranks. He attacks the "internal cleansing" fiend, who has a purity complex; he thus disposes of quite a large cult that traces most bodily ills to the colon. He tells us that Freudians could say why people are brown bread maniacs. What a lot of ink might have been saved during the past years if the brown *v.* white bread controversy could have been solved by psychoanalysis!

Let it not be concluded, however, that the book is outstandingly destructive; it is, in fact, mainly constructive. The use of economy of language, humour, exposition readily memorised and a lot of other virtues make this little volume one of the most stimulating ones among the many which have recently been published for the layman.

* Healthy Eating. *V. H. Mottram, M.A. Pp. 126. 3s. net.*

WORKS BOILER PLANT

This book* concentrates on operation and maintenance problems of boiler plant, particularly with reference to the ordinary small plant installed in thousands of industrial establishments throughout the country, and records recent technical progress of particular interest to small boiler operators.

The author states that "the book will perhaps appeal to those employees who are studying the subject with a view to improving their positions and relieving the works engineer of some responsibility. At the same time it is hoped that engineers in charge will find the matter of practical value in assisting them and their assistants in tracing troubles, correcting faults, and in other problems which arise in the daily operation of plant".

Heat and steam generation, combustion, fuel factors, mechanical stoking, heat recovery auxiliaries, heat economies, boiler feed-water treatment, boiler fittings and auxiliaries, operation and maintenance topics, and boiler plant testing are adequately covered, and the generous number of explanatory diagrams and drawings are useful.

* Works Boiler Plant. *F. J. Matthews, B.Sc. (Hons.). Pp. 184 with 88 illustrations and 20 tables. 10s. 6d. net.*

NEWS FROM THE INDUSTRY

Captain H. Leighton Davies, C.B.E.

Among the industrialists included in the New Year's Honours Lists figures the name of Captain H. Leighton Davies, whose many-sided career with Baldwins, Limited, and the local steel and tinplate industries is well known.

Captain H. Leighton Davies is noted for the extent of his activities within the major industries, both locally and nationally, and in the public and social life of the district in which he resides. He had been chairman of the Tinplate Conference, the output organisation of the Welsh Plate and Sheet Manufacturers' Association from 1925 till last year, when he succeeded Sir William Firth as chairman of the Association.

On the outbreak of the war, he was appointed Director of Scrap and Director of Tinplate at the Ministry of Supply, but resigned after three months, believing he could better serve the industry in his normal sphere, although he remained adviser to the Ministry on steel, tinplate and scrap.

On his return, he resumed the chairmanship of the Siemens Steel Wages Board, and he is vice-chairman of the South Wales Siemens Steel Association, and has been South Wales manager of Baldwins, Limited, since 1927.

His membership of international associations include chairmanships of the International Scrap Association and of the Scrap Committee of the British Iron and Steel Federation, and member of the latter's industrial committee.

* * *

Ministry of Food Appointment

The Minister of Food has appointed Mr. H. L. Sanderson as Director of Rice Supplies. Mr. Sanderson was formerly Chairman of the London Rice Brokers' Association.

* * *

Baking Trade Board Appointment

Mr. R. Stirling, bakery manager of the St. Cuthbert's Co-operative Society, Edinburgh, has been appointed one of the three Co-operative representatives on the Baking Trade Board (Scotland), in succession to Mr. J. C. Finlayson, who has resigned.

* * *

Paisley War Weapons Week

Messrs. Brown and Polson, Ltd., cornflour manufacturers, Paisley, have contributed £10,000, while the sum of £2,200 was subscribed from the firm's employees' savings group, to the Paisley War Weapons Week.

* * *

Trade Marks in Egypt

Of interest to those British firms exporting their goods to Egypt is a reminder, sent to us by a firm of Patent Attorneys in Cairo, that traders wrongfully using upon goods in that country the words "Registered Trade Mark" in connection with a trade mark that has not been registered under the new Egyptian Trade Marks Law will be prosecuted. The Comptroller has issued an official notice giving full details, to which those interested are referred.

Tenders for Canadian Canning Plant

Canada packers are calling for tenders for rebuilding their plant on Burford Road, Brantford, Ont., destroyed by fire in August. Plans for the new building call for a two-story processing plant to be erected upon the foundations of the previous structure, immediately to the east of which will be a one-story warehouse, with a floor area of approximately 11,000 square feet. The new plant will be equipped for the canning of peas, corn and tomatoes, as well as of a full line of fruits. Special consideration is being given to installation of the most modern equipment for quick freezing fruits and vegetables. It is estimated that the new plant will have approximately 50 per cent. greater capacity than the old.

* * *

Canning in Canada

Considerable improvement in the canning industry this year was reported by President W. Bryce Hyslop to the Convention of the Canned Foods Association of Ontaria in Toronto.

The improvement came about largely because decreased packs of vegetables in both 1939 and 1940 reduced the stocks of canned goods on hand, he explained.

"During this century the annual turnover of the Canadian canning industry has increased from $8,000,000 to $65,000,000," he stated.

The prohibition of the import of United States canned grapefruit juice was asked by the Association at Ottawa this year, he remarked, with the reply from the Government that such an action would be contrary to provisions of the Canada-U.S. trade agreement.

* * *

New Scottish Canned Soups

The new range of canned soups marketed in Scotland under the name of Jean Macgregor Scottish Soups are being manufactured by a newly registered company with premises in an industrial estate in Renfrewshire. The range includes Scotch Broth, Mutton Broth and Kidney Broth.

All are prepared under modern conditions according to recipes which have been in use in Scottish kitchens, but which have not previously been used by canned soup manufacturers.

* * *

Canning Factories in Scotland

One of the main points in connection with the development of local industries, made in a plan for the rehabilitation of rural Scotland after the war, which has been drawn up by Professor Alan G. Ogilvie and Dr. Arthur Geddes, two geographers of Edinburgh University, is the need for greater production of foodstuffs and the establishment in the rural area of canning factories to deal on the spot with surpluses of fruit and vegetables.

This plan has been published in the *Edinburgh Journal of Science, Technology and Photographic Art*, which is issued by the Royal Scottish Society of Art.

It is stated by the two authors that the average Scottish dietary would be improved by the addition of more green vegetables, and the growing of these would occupy more people on the land.

* * *

Factory Lighting

How great the advances in factory lighting have been in the past thirty years can be gathered from an interesting contribution by Sir Duncan Wilson, lately Chief Inspector of Factories, to the January, 1941, issue of *Occupational Psychology*. Sir Duncan has given an historical account of the work of the Departmental Committee on Lighting in Factories, from its foundation in 1913 up to, and including, the publication of its recent important fifth report.

Dr. C. S. Myers has contributed to the same number a discussion of the conditions of work and the requirements of both routine and specialised scientific workers in industry. This should be of interest both to industrialists and industrial scientific workers, for Dr. Myers considers some of the temperamental and other qualities called for, incentives, opportunities for promotion and improvements that might be made in selection and training.

* * *

Essential Oils and Spices

Essential oils and spices form the basis of many of the flavours used by biscuit and confectionery manufacturers. To-day the importation of essential oils of non-Empire origin is severely restricted. Stocks in this country are a good deal lower than in peace-time, and forward shipments are taking longer to arrive, so that Stafford Allen and Sons, Limited, advise their friends to look well ahead in order to make sure that the continuity of their stocks of essential oils and flavours is assured.

Where particular flavours are no longer obtainable, the firm will be pleased to suggest suitable alternatives.

* * *

Tea for Industrial, Business and Clerical Workers

The Ministry of Food has extended for a further period the arrangements which enable groups of industrial, business and clerical workers to obtain tea for consumption during their working hours.

Current permits in the hands of retailers for the supply of tea for this purpose, many of which are on the point of expiring, can be regarded as extended for a further period of eight weeks.

There is no need for the time being to apply to the local Food Officer for the renewal of permits.

* * *

Reconstruction at Scottish Food Factory

Chivers and Sons, Ltd., are to carry out reconstruction work at their former Scottish premises. Plans have been passed for this.

Horizontal Gilled Tube Economiser

The external "diamond" form of tube body characterises one of the latest types of economiser made by E. Green, Ltd. The staggered tubes of diamond form possess self-cleaning properties to a high degree. The tubes are provided with rectangular gills, which minimise the possibility of soot deposits on any portion of the heating surface, while heavy flanges fitted with through bolts take the place of studs. Another prominent feature is that there are no jointing flanges in contact with the gases, all pressure joints being external to the gas chamber, and all gas passages are intercommunicating. This provides free gas flow, and enables the gases to spread over the whole of the heating surface, the minimum amount of which is provided by the use of rectangular gills.

* * *

Thermometer for Canners

Those among whose duties is the reading of retort thermometers know how difficult it often is to see the thread, and will be interested in an idea which has been patented in Great Britain, Canada, U.S.A., France and Germany, which is called the Red Reading Mercury Thermometer.

If a red column and a plain-mercury thermometer are placed behind a cloud of steam, and the observer walks a short distance from the spot, the difference between the visibility will be noted.

The red column is accomplished by reflection. The mercury is a natural mirror, so that by placing a strip of red or coloured glass by the side of the bore, or reading column, the red glass is reflected upon the mercury and as the mercury rises in the tube only a bright red column is seen. The mercury is not disturbed in any way, and the effect is produced of reading a wide red column with all the valuable properties of pure mercury.

One advantage of this patent feature is that it can be furnished on repairs to any make of thermometer. This system is applied to all types of thermometer, such as incubator thermometers, brewers' and canners' thermometers and also on oven and refrigerator types. The makers are the Industrial Thermometer Company.

* * *

Lovell and Christmas

The directors of Lovell and Christmas, provision merchants, etc., are paying a dividend of 3 per cent. on the Preference shares for the half-year ended December 31, 1940, but are making no interim distribution on the Ordinary shares in respect of that period.

There was no Ordinary interim in 1940, but at the close of the year the Ordinary received 6 per cent.

* * *

Rio Flour Mills

Rio de Janeiro Flour Mills and Granaries is paying a final dividend of 5 per cent., making 8 per cent. for the year ended September 30 last—the same total as for 1938-39. Issued capital is £1,364,838.

Hand Fire Extinguishers

An outstanding new development in connection with hand fire extinguishers is a method of extinguishing incendiary bombs of the electron (magnesium alloy) metal and thermite type, using a mixture of inorganic salts which become molten and extinguish the bomb by sealing the crevices and cooling to below the ignition point. One general method of application is to dissolve the salts in the water charge, with the solution propelled as usual by carbon dioxide gas, so that the same extinguisher serves a double purpose, depending upon whether it contains water for ordinary fires or the special anti-thermite solution for A.R.P. work.

This has been evolved by the Nuswift Engineering Co., Ltd., who make the R.S.Q. machine, in which only water and compressed carbon dioxide are used.

* * *

Materials for Animal Feeding

War-time difficulties in the operation of the cod-fishing industry have led to the introduction of two new materials for animal feeding. The first, B.S. 909, War Emergency B.S.S. for vitamins A and D in Oil for Animal Feeding Purposes, is a diluted cod liver oil—a mixture of cod liver oil of high vitamin potency with other edible oil—and the second, B.S. 910, War Emergency B.S.S. for Controlled Cod Liver Oil Mixture for Animal Feeding Purposes, a solution of vitamins A and D in edible oil.

The British Standards Institution, with the approval of the Ministry of Food and the Ministry of Agriculture and Fisheries, has now issued Standards for these substitutes—B.S. 909, Vitamins A and D in Oil for Animal Feeding Purposes, and B.S. 910, Controlled Cod Liver Oil Mixture for Animal Feeding Purposes.

The British Standards require the materials to have vitamin potencies of a sufficiently high level for animal feeding purposes, and it is stipulated that the British Standard Chick Test, B.S. 911, shall be the standard for ensuring that all the vitamin D present is of the form suitable for poultry feeding.

* * *

Night Baking

Representations have been made by the Scottish Union of Bakers, Confectioners and Bakery Workers to Mr. Ernest Bevin, Minister of Labour, requesting the abolition of night work in all bakeries.

Mr. George Laidlaw, secretary of the Union, states that Co-operative bakeries, including the United Co-operative Baking Society, Glasgow and Clydebank, which employs more than 2,000 men and women, and is probably the largest in Britain, would welcome the prohibition of night work.

Operatives allege that night baking is exploited by a few firms in Glasgow to produce supplies which are sent to other parts of the country at the expense of local employers and operatives.

The decentralisation of production, the Union maintains, is essential for the safeguarding of supplies during crises.

OBITUARY

Mr. James H. Randall

We regret to announce the sudden death of Mr. James H. Randall in his seventieth year. Although in failing health for several weeks, he passed away peacefully after a brief illness.

Mr. Randall, Senr., was the founder of the firm and was engaged in its development since 1885, and was thus one of the pioneers of the industry. He had many friends and associations throughout the trade, and with his passing another link with the past is broken.

The business will continue as before under the management of Mr. J. E. Randall.

* * *

Lecture on Sugar Problems

The employment of alternative materials to replace sugar in confectionery was discussed by Mr. F. F. Farrage in a lecture given recently to the Manchester and District Master Bakers, Confectioners and Caterers Association, during which he gave manufacturing confectioners some excellent practical advice.

Recommending the use of a liquid sweetener containing specially processed saccharin and glucose in an edible base to replace 50 per cent. of the normal sugar content in cake mixes, with the exception of sponge goods, Mr. Farrage said that it enabled the lost weight caused by the reduction of the sugar to be replaced without an increase in the original cost. In yeast doughs, the whole of the sugar may be replaced, as also in custards, scones, and rock cakes.

Another important ingredient which acts in a manner similar to sugar in splitting up the gluten into simple proteins is yeast. The idea of using yeast in cake may be revolutionary (said Mr. Farrage), but many makers were using ½ oz. to every 10 lbs. of additional flour added. No aeration is expected from the yeast, but it is there simply as an aid to making a first-class cake with reduced sugar content.

Mr. Farrage is a member of the firm of Cumming Parsons, Ltd., who are the manufacturers of a liquid sweetener and also the butter flavour "Twinlink".

* * *

New Frosted Food Centre

A well-known food firm in the famous shopping centre of Princes Street, Edinburgh, R. T. Gibson, Ltd., have opened a new Frosted Food Department. Among the frosted foods being featured at the present time are strawberries, fresh green peas and a wide range of frozen natural fruit and vegetables. The venture has proved very popular to date and promises to become an important part of the store.

* * *

Chilled Beef from Uruguay

Uruguayan farmers have given 55 tons of chilled beef, valued at £2,700, for shipment to Britain. This shipment consists of 816 quarters, each with a card "Gift of Uruguayan farmers. Good luck."

INFORMATION AND ADVICE

Waffle Mixture — Treatment of Vegetables — Hen Albumen Substitutes — Information Supplied

Waffle Mixture

7,117. *We should be glad to know if you could give us a formula for the manufacture of so-called "Waffle Mixture", or "Powder", and oblige.* (Berks.)

There is considerable doubt about the possibility of making a really good waffle from a "dry mix", because the usual way is to incorporate whipped egg or egg whites into the soft batter immediately before cooking, otherwise it is not possible to obtain the maximum lightness in the waffle. The two recipes given include very large quantities of baking powder, and, owing to this, give fairly good results, but it is necessary that the fat be rubbed through the dry ingredients.

WAFFLES (DRY MIX)

	(1)		(2)	
	l b.	*Ozs.*	*Lb.*	*Ozs.*
Flour	1	—	1	—
Margarine	—	6	—	4
Salt	—	¼	—	¼
Dried egg	—	1	—	1
Milk powder	—	1	—	1
Baking powder ...	—	2	—	2
Weight of dry mix ...	1	10¾	1	8¼
Water to above ...	—	12	—	12

We should like to call your attention to the distinct danger of rancidity development in the fat, and if the dry mix is to be stored for any length of time we doubt whether the methods given will be satisfactory. However, you will doubtless be able to make up some sample lots in order to test the storage properties of the product.

Method.—Finely powder the dried egg and mix with the milk powder and salt. Rub the margarine through the flour and mix all the dry ingredients thoroughly and sufficiently to pass through a fine sieve without residue.

For use mix the required quantities of water and proportionate dry ingredients together into a batter free from lumps and allow to stand ½ to 4 hours before cooking in a hot, lightly greased waffle iron.

The above quantities are sufficient for 2 dozen waffles on a 5-inch-diameter circular plate.

Treatment of Vegetables

7,153. *As subscribers of your excellent journal, I believe that we are entitled to have questions answered in connection with our business.*

(1) *Can you give the name of a manufacturer who makes a cutting or shredding machine that will "crumb" bread and vegetable matter (such as cabbage, beans and potato peelings) to a size of not more than ¼-inch cube or to a size of coarse chopped parsley when cut by hand?*

(2) *Waste vegetable matter and waste food quickly putrefies. Is this caused by the moisture content in it, which is about 80 per cent., or some other cause? To what point must moisture be reduced in order to preserve the waste food in the form of a meal?*

(3) *In the event of waste vegetable matter being semi-putrid, will washing in weak chlorine and subsequent drying out of nearly all the moisture render it fit for animal feeding-stuff?*

(4) *What is the average analysis of vegetable matter such as cabbage, potato, and beans—in the form of albuminoids, carbohydrates, protein, etc.?* (London.)

(1) Names of suppliers were given.

(2) The final moisture content of dried vegetables varies somewhat according to the material, but you may take it as a fairly safe rule that the moisture should not exceed 5 per cent. Of course, things like dried fruits, having a large amount of sugar content, have more moisture than this; for instance, the flesh of dried prunes contains 23 per cent. moisture, but, on the other hand, contain 40 per cent. sugar.

(3) With regard to your suggestion to render semi-putrid vegetable matter into animal feeding-stuff, apart from the undesirability of this, we hardly think that it would be a commercial proposition, as, in addition to the handling costs involved, the yields would be very much reduced.

(4) The average analyses of cabbage, potatoes and beans are according to *McCance and Widdowson*, as follows:

g. per 100 g.

	Edible Matter, as Eaten.	Moisture	Unavailable Carbohydrate.	Sugar.	Starch (as Glucose).	Total Nitrogen.
Cabbage ...	70	89·7	3·4	3·5	0·0	0·27
Runner beans	86	91·6	3·0	2·7	0·2	0·18
Potatoes, old	86	75·8	2·1	0·5	20·3	0·34

g. per 100 g.

	Protein (N×6·25).	Fat.	Available Carbohydrate
Runner beans ...	1·1	Trace	2·9
Cabbage	1·7	Trace	3·5
Potatoes, old ...	2·1	Trace	20·8

Hen Albumen Substitutes

6,692. *Can you give us any information on hen albumen substitutes or do you know of any patents on same? Can duck albumen be used in its place for making icing meringues, etc.?* (Surrey.)

With regard to patents, you would be able to find these at the Patent Office Library.

To ascertain whether duck albumen could be used for meringues in place of hen albumen, why not make a small trial, which would readily demonstrate whether the former serves your particular purpose?

Information Supplied

7,009. *We shall be greatly obliged if you will be kind enough to let us know whether you are able to put us in touch with any manufacturers of 35-gallon capacity preserving pans.*

These are required for export to fruit growers in South America, so that it is assumed that the pans would be required for the preserving of soft fruits such as plums, etc. We understand from our friends that they would consider good second-hand pans if you know of anybody who deals in this class of equipment. (London.)

Names of manufacturers of preserving pans and also second-hand machinery dealers were given.

6,543. *We believe a great many fried fish shops use cotton-seed oil, and we want to determine the amount of vitamin E and do other experiments on the kind of oil in general use. Can you please tell us the names of one or two firms who between them supply the bulk of frying oil used in this country, so that we may obtain a few representative specimens?* (Cambridge.)

This was done.

6,544. *We are interested in synthetic sausage casings, and shall be glad if you will give us the address of the makers.* (Manchester.)

This was done.

7,200. *We have received an enquiry from one of our connections in the Dutch East Indies for quotations for meat-slicing machines and butter machines, and I shall be glad if you will advise me the names of one or two firms who would be in a position to quote competitive prices for this market in order that I may pass this enquiry on.* (London.)

This was done.

6,461. *Please furnish us with the name and address of the manufacturing proprietors of "Nulomoline."*

Name of manufacturer given.

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.)

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

Improvements in or relating to the Pasteurisation and Sterilisation of Bottled Goods and Materials for Use therein

The present invention comprises a process of pasteurising or sterilising bottled goods by the use of machines, in which the bottles are sprayed with or immersed in water, wherein there is added to the water used an alkaline composition including a substance serving to produce a protective coating on the metal parts, more particularly the iron parts, of the machine.

Thus, in one form of the invention an alkaline composition containing tannic acid or a tannate is added to the water. Instead of employing commercial tannic acid a decoction of cutch (black catechu) may be used.

It has previously been proposed to add a mixture of trisodium phosphate and tannin to a water-containing system such as a boiler, to form a protective film of iron tannate, with the object of preventing incrustation. In this case the solution was approximately neutral, having a *p*H value of 7. The present invention is for a different purpose and requires an alkaline solution—*i.e.*, a higher *p*H value.

A specific composition for addition to the water, which will be given by way of example, is as follows:

	Per Cent.
Tannic acid	4
Bleaching powder (35 per cent. Av.Cl_2)	2
Ammonium sulphate	2
Caustic soda	20
Sodium silicate. 140° TW. ..	10
Tri-sodium phosphate hydrated	5
Sodium hexametaphosphate ..	2
Potato starch	1
Water	54

This composition, which may be used in a proportion of 1 lb. per thousand gallons of water, has various advantages.

The tannic acid combines with some of the caustic soda to form sodium tannate, which in turn produces a protective film of metallic tannate such as iron tannate on the carriers, chains, baskets, or tanks, and so shields the metal from the action of the water. The calcium hypochlorite introduces chlorine, which destroys yeasts, bacteria, and the like and thereby assists in reducing or eliminating the smell and corrosion. The ammonium sulphate serves to stabilise the chlorine. The caustic soda, in addition to converting the tannic acid into soluble sodium tannate, also introduces alkalinity to neutralise the acidity of the beer or of the milk. The sodium silicate, the tri-sodium phosphate, and the sodium hexametaphosphate contribute to the alkalinity and also by base exchange soften the water and thereby prevent an objectionable bloom which is liable to appear on the bottles when hard water is used. Furthermore, the tri-sodium phosphate emulsifies the fats, etc., released into the water in the case of milk machines, and so prevents fat deposits forming on the bottles and on the machines. The starch serves primarily to make the product into a paste, in which form it is more readily handled.

In apparatus employed at present the chains and tanks are generally of black iron, whilst the baskets and carriers are generally of galvanised iron. Where a compound according to the invention is employed it may be unnecessary to employ galvanised iron for the baskets and carriers.

527,314. Harold Albert Hadleigh Crowther.

Latest Patent Applications

15109. BRITISH THOMSON-HOUSTON CO., LTD.: Food storage receptacle for refrigerators. Oct. 10.

15141. NICORESTI, J.: Process for the manufacture of sugar substitute. Oct. 11.

15142. NICORESTI, J.: Process for the manufacture of reconstituted cream or butter. Oct. 11.

Specifications Published

525,820. DYER, E. J.: Preparation of dried foodstuffs from bananas.

525,766. HADDAN, R. (KELCOX CO.): Making bread and other bakery products.

525,930. MAY, GEB. VENDT, A.: Materials for preserving fruit and vegetables.

525,490. LEACH, A. E., and MARCO REFRIGERATORS, LTD.: Thermally insulated container for foodstuffs and the like.

527,607. TANIKAWA, R.: Methods of keeping cold or refrigerating foodstuffs for preservation purposes.

527,694. MOLDAWSKY, J.: Apparatus for tendering meat.

527,876. CLEEF, L. VAN: Method of freezing fresh fruit and storing the same in frozen condition.

TRADE MARKS

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

ARCTIC SNOW.—B 612,443. Soft ice-cream. **Ross's Dairies, Ltd.,** 572, Dumbarton Road, Glasgow, W. 1. (By Consent.) Oct. 30.

TREX.—606,060. Biscuits (other than biscuits for animals), cakes, pastries and confectionery; flour, sugar, rice, tapioca, sago, honey, treacle, syrup, yeast, baking powder, salt and spices, almond paste, custard powder, cornflour, dough seasonings, and flavourings (other than essential oils). **J. Bibby and Sons, Ltd.,** 12, King Edward Street, Liverpool. (Associated.) Oct. 30.

Defensive Trade Mark Application based on Registration No. 584,151 (3138) xlii.

DELECAISE.—612,557. Preserved vegetables, preserved fruits, preserved meats, preserved poultry, preserved game, preserved fish and meat extracts. **Norman Foods, Ltd.,** Hastings House, Canning Street, Birkenhead; manufacturers. August 14, 1940.

GUARDIAN.—612,772. Preserved, canned, dried and bottled fruits and preserved, canned, dried and bottled vegetables. **Batger and Co., Ltd.,** 102, Brook Street, Ratcliff, Stepney, London, E. 1; manufacturers. September 6, 1940. To be associated with No. 527,677 (2805) xlii.

HONEY BOY.—612,935. Honey, preparations of honey and sugar, and sweetmeats made from honey. **The Bear Honey Co., Ltd.,** Garvin House, Twickenham Road, Isleworth, Middlesex; manufacturers and merchants. October 1, 1940. To be associated with No. 605,847 (3192).

OBIX.—612,210. Farinaceous preparations for making gravy. **Brown and Polson, Ltd.,** Cornflour Works, Carriage Hill, Paisley, Scotland. Sept. 11.

Mark is registered.

RENEG.—612,890. Egg substitutes. **John F. Renshaw and Co., Ltd.,** Locks Lane, Mitcham, Surrey; manufacturers. September 25, 1940. To be associated with No. 459,689 (2474) xlii and another.

VEDAST.—*Use claimed from the year 1923 for jams, marmalade and marrowfat peas; from the year 1928 for mincemeat; from the year 1931 for table jellies (crystals) and from the year 1934 for split peas, butter beans, haricots and lentils. Section 12 (2).* 609,838. Table jellies (crystals), jams, marmalade, mincemeat, dried marrowfat peas, split peas, butter beans, haricots and lentils. **Hunt-Cropp and Sons, Ltd.,** Vedast Works, St. Vedast Street, Norwich, Norfolk; wholesale grocers. November 27, 1939. To be associated with No. 609,839 (3271) xxx and others.

YEASTASE.—609,920. Malt extracts. **Cyril Gonville,** 63, The Broadway, Stratford, London, E. 15; technical chemist. December 2, 1939.

NEW COMPANIES

Meredith and Drew Sales Corporation, Ltd. (364308.) To carry on the bus. of biscuit mnfrs. and distributors, etc. Dirs. not named. Subs.: T. K. Wright, Fenny Drayton Close, Leicester; R. A. Jones, Queen's Hotel, Ashby-de-la-Zouch; R. D. Cooper, 71, Market Street, Ashby-de-la-Zouch.

William Moss (Packers), Ltd. (363980.) 20, Brazennose Street, Manchester. To carry on bus. of packers of consumable goods, etc. Dirs.: W. Moss, 18, Poplar Road, Swinton, near Manchester; L. B. Webster, 4, Daylesford Road, Cheadle, Cheshire; D. A. Ross, Wythengate, Wythenshawe Road, Northenden.

North Lincs. Hay and Straw Company Limited. (363166.) Riverhead, Louth, Lincs. Hirers of and dlrs. in agricultural machinery of all kinds, corn mchts., etc. £1,000. Dir.: B. T. West, address not stated. Subs.: F. W. Hufton, 27, Cromwell Road, Grimsby; G. H. Fowler, 300, Laceby Road, Grimsby.

Regale Food Products Limited. (363089.) Vulcan House, 56, Ludgate Hill, E.C. 4. Nom. cap.: £500 in £1 shs. Dirs.: Not named. Subs.: A. L. Crowder, 53, Clifton Road, N. 3; N. Spiro, The Beeches, Rathgar Close, N. 3.

S. Steenhuis and Co. Limited. (363110.) To carry on business as preservers of fruit, vegetables, etc. Nom. cap.: £1,000 in £1 shs. Dirs.: St. Steinhuis, Immenhof, Knott Park, Oxshott, Surrey; H. G. Wray, 32, Stainforth Road, Newbury Park, Essex.

W. G. Barnett, Ltd. (364374.) 108, Mackenzie Road, Beckenham, Kent. To carry on the bus. of bakers, confectioners, etc. Nom. cap.: £500 in £1 shares. Dirs.: W. G. Barnett, 108, Mackenzie Road, Beckenham, Kent; Eva C. Barnett, 108, Mackenzie Road, Beckenham, Kent.

Farmers' Food Supplies, Ltd. (364313.) To carry on the bus. of mnfrs. of and dlrs. in animal food, etc. Nom. cap.: £100 in £1 shares. Dirs.: Not named. Subs.: J. E. Walker, 170, Poplar Road South, S.W. 19; Lily Page, 43, Thackeray Road, E. 6.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.